SMITHSONIAN
LIBRARIES

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 36

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

AIMS AND OBJECTS

OF THE

MUSEUM OF THE AMERICAN INDIAN, HEYE FOUNDATION

(THIRD PRINTING)

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
1923

SMITHSONIAN LIBRARIES

THIS series of INDIAN NOTES AND MONOGRAPHS is devoted primarily to the publication of the result of studies by members of the staff of the Museum of the American Indian, Heye Foundation, and is uniform with HISPANIC NOTES AND MONOGRAPHS, published by the Hispanic Society of America, with which organization this Museum is in cordial coöperation.

Only the first ten volumes of INDIAN NOTES AND MONOGRAPHS are numbered. The unnumbered parts may readily be determined by consulting the List of Publications issued as one of the series.

MUSEUM OF THE AMERICAN INDIAN, HEYE FOUNDATION

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 36

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

AIMS AND OBJECTS

OF THE

MUSEUM OF THE AMERICAN INDIAN, HEYE FOUNDATION

(THIRD PRINTING)

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
1923

AIMS AND OBJECTS
OF THE
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION

THIS Museum occupies a unique position among institutions, in that its sole aim is to gather and to preserve for students everything useful in illustrating and elucidating the anthropology of the aborigines of the Western Hemisphere, and to disseminate by means of its publications the knowledge thereby gained.

Inception

The Museum had its inception twenty years ago, when its present Director, pursuing his interest in the material culture of the American Indians, commenced the systematic accumulation of objects pertaining thereto. The first important collection was procured in 1903, a representative gathering of earthenware vessels from prehistoric Pueblo ruins in Socorro county, New Mexico; in the following year a similar collection that had been found in a cave in eastern Arizona was obtained; and trips to Porto Rico, to Mexico, and to Costa Rica and Panama, by associates of Mr Heye, resulted in other gatherings of important artifacts. These objects, with those previously assembled, formed a nucleus to which accessions have continuously been made until at the present time the number of objects illustrating the archeology and ethnology of the American Indians exceeds a million.

South America

But the first comprehensive plans for systematic research among the Indians and their remains were not fully developed until 1906, in which year Mr Heye became associated with Prof. Marshall H. Saville, of Columbia University, who planned a series of researches to cover the archeology of the Andean and coast regions of South America from southern Ecuador northward to Darien, thence to the West Indies. In the commencement of this research Mr Heye was fortunate in having the active interest and aid of his mother, the late Marie Antoinette Heye, through whose coöperation Professor Saville's studies were made possible. In all, nine field seasons have been spent in the area mentioned. In 1907 Professor Saville had the assistance of Mr George H. Pepper, who assumed immediate charge of the excavations inland from Manta in the province of Manabi, Ecuador; in 1910 the aid of Dr Manuel Gamío, at present Director of Anthropology and Inspector of Monuments of Mexico; while in 1908 and 1909 Dr S. A. Barrett, now of the Milwaukee Public Museum, carried to completion an ethnologic study of the almost unknown Cayapa Indians of northwestern Ecuador, a monograph pertaining to which will shortly be published. The results of Professor Saville's archeological work in Ecuador and Colombia have been of great importance, both from the point of view of knowledge obtained and of collections gathered, as the culture of the prehistoric tribes of the regions explored has for the first time been made known. One of the immediate results of these studies is the report on The Antiquities of Manabi, Ecuador, issued in two quarto volumes in 1907 and 1910. The artifacts from Ecuador, and later from Colombia, consist chiefly of earthenware vessels, some of them large burial urns, stone objects (including many massive carved seats), and ornaments of gold and platinum.

West Indies

Soon after the South American research was initiated, an archeological survey of the West Indies was commenced, in 1907, the Reverend Thomas Huckerby undertaking that pertaining to St Vincent, subsequently extending the reconnaissance to Tobago, Trinidad, Grenada, Carriacou, Cannouan, and many smaller islands of the Lesser Antilles, and of the Windward Islands, the collections illustrating the culture of the early West Indians being very numerous and comprehensive.

The work initiated by Mr Huckerby was extended in 1912 by the late Theodoor de Booy, who in that year became attached to the staff of what had become popularly known as the "Heye Museum." Many journeys were made to the islands by Mr de Booy in the interest of the Museum, first to the Bahamas and Caicos, later to Jamaica, Santo Domingo, eastern Cuba, Margarita, Trinidad, the Dutch Indies, and the Virgin Islands immediately after their transfer to the United States, during all of which, extending to the year 1918, he was notably successful in gaining information and objective material. The work of the Museum in the West Indies has resulted in an accumulation of artifacts that exceed in number and importance all others from those islands throughout the world, many of the objects being unique.

Visits to the West Indies were also made in the joint interest of the Museum and of the Smithsonian Institution by Dr J. Walter Fewkes of the Bureau of American Ethnology at Washington, who conducted archeological explorations in St Vincent and Trinidad. Subsequently Mr M. R. Harrington, of the Museum staff, following Mr de Booy's reconnaissance, proceeded to eastern Cuba, where archeological studies of prime importance were conducted, resulting in the determination of the cultural sequence of the early aborigines and in gathering many artifacts of the highest scientific value.

United States

While these researches were being made and collections of materials obtained beyond our immediate borders, work at home was not neglected; indeed, so extensively were collections being gathered in the United States that the Museum was twice compelled to move from limited temporary quarters. Mr Harrington had long been a student of the ethnology and archeology of the Indians of the United States, and had sojourned among many tribes and in many localities in behalf of the Museum, commencing in 1908. The results of his field trips have been most prolific, and through them the Museum's collections have been enriched in a manner that seemed impossible at the time the work was commenced. Especially noteworthy among the objects thus procured are a large number of sacred bundles, or packs, from numerous tribes, formerly used in connection with scalping, war, tattooing, and other ceremonies. Rare in themselves, these bundles are especially valuable to ethnology both by reason of the insight into the esoteric life of the Indians which they afford, and because they are usually the repositories of various objects of the kind often buried with the dead and thus lost to science.

Other Expeditions

Many other ethnological expeditions have been made, and to various localities, notable among which were the journeys of Mr Alanson Skinner to the Menomini Indians of Wisconsin, and to the Bribri Indians of Costa Rica; of Mr Donald A. Cadzow to the Athapascan tribes of the far Northwest; of Mr E. H. Davis to the tribes of the Southwestern deserts, southern California, and northwestern Mexico; of Mr G. W. Avery to Lower California and to the Seri of Tiburon island in the Gulf of California; of Dr Frank G. Speck among the Montagnais and Mistassini of Canada, and the Penobscot and related tribes of Maine; of Messrs Hodge and Nusbaum to the Havasupai of Cataract cañon, Arizona; of Dr T. T. Waterman among the Puget Sound Indians, and of Mr

W. Wildshut among the Crows, Blackfeet, Shoshoni, and Arapaho, among which tribes he succeeded in procuring more than 300 medicine bundles, including the sacred pipe and beaver bundles of the Blackfeet and the skull bundles of the Crows, thus adding materially to the already remarkable collection of such objects in the Museum.

Other Archeological Work

Pursuing its archeological work, the Museum in 1914 explored a Munsee Indian cemetery at Minisink, near Montague, New Jersey, revealing its historic occupancy; in 1915 the great Nacoochee mound in Georgia, a noted Cherokee site, was excavated, likewise several mounds in North Carolina; in 1916 Mr Warren K. Moorehead of Phillips Academy and Mr Alanson Skinner of the Museum explored several sites along the Susquehanna, and Mr Skinner also conducted excavations at Las Mercedes Costa Rica. Dr Thomas Gann, in 1916–17, conducted important archeological studies, in behalf of the Museum, in British Honduras. More recently much work of the same general character has been done in New York state, especially at Inwood on

Manhattan Island, on Long Island, and in Cayuga and Jefferson counties. Among the most important of the investigations in New York City were those conducted at Throgs Neck and Clasons Point, at sites that were still inhabited at the coming of the Dutch in the seventeenth century. This work was made possible by the liberality of Samuel Riker, Jr., Esq., a trustee of the Museum, who has manifested his interest in this and in other ways and who contributed also the means for the publication of the interesting results of the Throgs Neck and Clasons Point field-work.

Productive of important results, both in the way of information and of collections, was an expedition to Kane county, Utah, in the autumn of 1920, by Mr Jesse L. Nusbaum, where an ancient site of the so-called Basket-makers was thoroughly explored. For the important finds there made the Museum is indebted to General T. Coleman du Pont, who afforded the means for conducting the work and of publishing the results.

The investigations noted have been productive of many objects, consisting of pottery, stone, bone, shell, wood, fabrics, basketry, etc., such as characterize ancient Indian culture in different localities and during various periods, but as the results have been published in the main, it is necessary to allude to them only in this general way. One of the most important fields of archeological research in the United States in which the Museum has engaged was carried on in 1916 and 1917 by Mr Harrington in Arkansas, where extended excavation enabled the identification of the sites as Caddo. This and subsequent work in Tennessee was done at the instance of Clarence B. Moore, Esq., a trustee of the Museum, whose own investigations of Indian mounds in the South, covering a period of many years, have added so much to our knowledge of the archeology of that region, and whose recent valued gifts of archeological specimens, derived from his own excavations, have added so much to the Museum's collections.

In 1922–23 a number of rockshelters were examined along White river in the heart of the Ozark region of northwestern Arkansas. Fortunately many of these shelters were exceedingly dry, resulting in the preservation of many articles, usually perishable, left by the prehistoric occupants, including among other things, basketry, textiles, and wooden objects. Of these the expedition secured a large collection, as well as a series of the more ordinary specimens in stone and bone. The cane basketry resembles the types characteristic of the tribes once living about the mouth of the Mississippi, but the presence of coiled basketry, pieces of feather- and rabbit-skin robes, the atlatl or spear-thrower with its darts, the metate, the basketry water-bottle lined with pitch, the wrapped legging, the woven sandal, and certain other features point toward some connection with the Southwest. Of special interest is the light shed on the people's agriculture by the finding of several woven bags containing seeds, among which were corn, beans, squashes, gourds, and sunflowers. Tobacco seed-heads and leaves were also found. A hoe with its mussel-shell blade still attached to its wooden handle with thongs of bark, and a hatchet with a crudely chipped flint blade set in its original haft of oak, figure prominently in the collection.

Mexico and Central America

Benefactors

No aboriginal American culture was developed so highly as that of the tribes of Mexico and Central America; hence, as above alluded to, the earliest plans of the founder and Director of the Museum included the exploitation of those vast and important fields as soon as the opportunity was afforded. To this end several expeditions were made to Guatemala, Honduras, British Honduras, and Costa Rica by Professor Saville in 1913 and the years following, and the opportunity was further increased soon after the definite establishment of the Museum of the American Indian, Heye Foundation, in 1916, and the selection of its board of trustees. Ever interested in the advancement of knowledge, James B. Ford, Esq., one of the trustees, pursued his policy of aiding scientific endeavor when he assumed pecuniary responsibility for much of the research thus far conducted by the

Museum in the countries to the south, as well as for rare and important collections which it has been so fortunate as to procure; and it was due to his further interest that the Central American investigations were now enlarged. These generous gifts, which have made the Museum preëminent in many ways, so far as Central America is concerned, have been augmented by Minor C. Keith, Esq., also a trustee, through his liberal donation of the largest collection of Costa Rican earthenware extant, and by Harmon W. Hendricks, Esq., likewise a trustee, who made it possible for the Museum to acquire, among other treasures, a marvelous sculptured vase from Guatemala—a gem of aboriginal handiwork, a description of which has been published in the form of a *Leaflet* through Mr Hendricks' further generosity. The importance of the Keith collection has already been manifested by a specialist who is using it as the basis of a memoir on the ceramic art of Costa Rica, to be published by the Museum.

Other Benefactions

In the matter of other collections Mr

Hendricks has been generous almost beyond measure. Thousands of priceless ethnological and archæological objects have been contributed by him from time to time—objects such as one would scarcely have believed to exist outside of museums. And not only this, for Mr Hendricks has made possible the excavation of the ruins of Hawikuh, one of the famed "Seven Cities of Cibola," occupied by the Zuñi Indians of New Mexico from prehistoric time until 1670, a work that has been in progress by the Hendricks-Hodge Expedition during the last six field seasons under the continued charge of Mr F. W. Hodge. In 1923 a joint expedition by the Museum and Mr Louis C. G. Clarke, director of the Cambridge University Museum, England, conducted under the immediate supervision of Dr S. K. Lothrop at Kechipauan, New Mexico, resulted in shedding additional light on the early culture of the Zuñi tribe.

Gifts by Trustees

In this brief summary only a few of the gifts made by trustees of the Museum, important as they are, can be mentioned. As proof of the interest he has always manifested, Mr Hendricks has presented, besides those mentioned, various large collections, including numerous polychrome vessels from the celebrated Casas Grandes of Chihuahua; two Penn wampum treaty belts, procured in London; a large number of gold ornaments from Colombia; a collection of archeological objects from Tennessee, Virginia, Kentucky, and Pennsylvania; a collection of archeological and ethnological specimens from the Chokoi tribe of Panama, and of ethnologic artifacts from the Plains Indians, gathered at Fort Laramie, Wyoming, about 1850; a collection of native woven blankets, belts, etc., from the Southwest and northern Mexico; and another illustrating the culture of the Yurok Indians of northern California.

Of no less importance and scientific value have been the gifts by Mr Ford, preëminent among which is a collection of seventeen mosaic objects consisting of wooden shields, masks, and an ear-ornament inlaid with turquois and other stones from Mexico (described and illustrated in a special volume published by the Museum). Until recently only twenty-four major examples of mosaic work had come to light and been placed on record by printed description and illustration. Of these, twenty-three are in Europe. The other specimen, from a cave in Honduras, is in possession of this Museum, also a gift from Mr Ford. Other gifts from this benefactor include extensive archeological collections from the California islands; the Lady Blake collection from the West Indies; many ivory carvings of the Eskimo; ethnologic objects illustrating the life of the Cree, and of the Eskimo of Hudson bay, Bering strait, and the Yukon territory; collections of antiquities from Mexico, Honduras, Guatemala, Brazil, and British Honduras (the latter including a fine series of painted Maya vases); and an ancient Inca textile, a marvel of aboriginal American art.

So extensive and important are the aboriginal artifacts presented by Messrs Ford and Hendricks, in addition to their benefactions in other ways, that it is no exaggeration to say that the collections which bear their names would form a worthy nucleus for any museum. Another trustee, F. Kingsbury Curtis, Esq., has given to the Museum the important G. T. Arms collection of archeological and ethnological material from Chile; while to another, Archer M. Huntington, Esq., the Museum is indebted, in the way of collections alone, for a series of original water-color drawings of Indian subjects by George Catlin, and for other important accessions.

The Museum Building

Indeed, the Museum owes much to the liberality of its trustees and to their active interest in its endeavors. Crowded in its quarters in a loft building, it was Mr Huntington who made possible the erection of a fireproof edifice to house its treasures, by the gift of a tract of land adjacent to The Hispanic Society of America. The American Geographical Society, and The American Numismatic Society, while other trustees, together with other friends of the Museum project, contributed liberally to the funds required for the building and its equipment.

Valued Contributions

Likewise generous have been those whose only direct relations with the Museum are their interest in its aims and objects.

Among these are Mrs Thea Heye, whose name is not only borne upon hundreds of valuable objects, including those forming a collection of Mocoa ethnological material from Venezuela, but who has met the expense of an expedition to Santa Catalina and San Miguel islands, and another to Santa Barbara, which have been productive of collections unequaled in their comprehensiveness and in their value to the study of the culture of former aboriginal inhabitants of California. Among the many valued gifts from Mrs Heye, special mention should be made of a collection of California basketry and of the entire shrunken body of a man from the Jivaro Indians of Ecuador, the result of the same process by which the well-known shrunken heads are produced by this tribe. Especially noteworthy among the other benefactors of the Museum are: the late Miss Edith Hendricks, who presented collections of ethnological specimens from the upper Amazon and of antique material from the Iowa tribe, as well as other objects; Mrs Charles R. Carr, of Warren, Rhode Island, an archeological collection from an historic Indian site at Burr's hill, the result of her husband's excavations; W. de F. Haynes, Esq., who contributed rare archeological objects from South Carolina and from Tennessee and adjacent states; the late W. J. Mackay, an Iroquois archeological collection from northern New York and Ontario; Rev. William R. Blackie, his collection representing the archeology of Westchester county, New York; Homer E. Sargent, Esq., and the late Mrs Russell Sage, notable collections of Indian basketry; Reginald Pelham Bolton, Esq., who not only has given various archeological specimens from New York City and vicinity, but has contributed of his valued services without stint in the Museum's field-work; Rodman Wanamaker, Esq., twelve sculptured stones from Guatemala, including a large and unique slab; Dr George Bird Grinnell, a valuable collection of ethnological objects from the Cheyenne and Blackfoot tribes; Gordon MacCreagh, Esq., numerous artifacts illustrating the ethnology of the Tukano Indians of the Brazil-Colombia border. Altogether, the specimens presented to the Museum since its foundation, by those connected with it only through sympathy with its endeavors, number nearly 30,000.

Growth

Study Collections

So greatly and so rapidly have the collections of the Museum increased that they have already practically outgrown the building, consequently the objects exhibited are only a small part of those in the Museum's possession. Owing to these limitations of space it has been necessary to present to the public view only relatively small synoptic series of objects illustrating, in an admittedly meager way, the culture of the Indians which they represent. But the main object of the Museum is not to appeal to the general public, welcome as it will be to view the exhibits; rather it is the aim to afford to serious students every facility for utilizing the collections in their researches. To this end there are many thousands of unique specimens in the study series which will always be available for this purpose and which indeed have already been thus extensively used.

Physical Anthropology

Pursuant to the policy of the Director

to expand the activities of the Museum as opportunity afforded, there was established, under the patronage of Dr James B. Clemens, a division of physical anthropology, now in immediate charge of Dr Bruno Oetteking, which has the care and study of the skeletal material obtained.

Publication

Following the issue of the two quarto volumes on the Antiquities of Manabi, Ecuador, the publications were confined to a series of *Contributions from the Museum*, consisting largely of articles by members of the staff, reprinted from scientific journals. In the spring of 1919, however, following his liberal patronage especially in the direction of the physical needs of the Museum, Mr Huntington contributed the means for the publication of a series of *Indian Notes and Monographs*, which not only affords an unusual opportunity for disseminating the results of studies by members of the staff and by the Museum's collaborators, but which has greatly stimulated activity in this direction. It is therefore due to Mr Huntington's interest that the Museum, even in the short time during which his generous gifts have been available, has been enabled to issue sixty-nine works in the series mentioned, ranging in size from a few to many hundreds of pages and most of them profusely illustrated. A list of these and of the other publications of the Museum will be sent on application.

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 36

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

LIST OF PUBLICATIONS OF THE MUSEUM OF THE AMERICAN INDIAN, HEYE FOUNDATION

FOURTH EDITION

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
MARCH, 1924

THIS series of INDIAN NOTES AND MONOGRAPHS is devoted primarily to the publication of the result of studies by members of the staff of the Museum of the American Indian, Heye Foundation, and is uniform with HISPANIC NOTES AND MONOGRAPHS, published by the Hispanic Society of America, with which organization this Museum is in cordial coöperation.

Museum of the American Indian,
Heye Foundation,
Broadway at 155th St.,
New York City.

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 36 (37)

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

LIST OF PUBLICATIONS OF THE MUSEUM OF THE AMERICAN INDIAN, HEYE FOUNDATION

FOURTH EDITION

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
MARCH, 1924

PUBLICATIONS OF THE MUSEUM OF THE AMERICAN INDIAN, HEYE FOUNDATION

The George G. Heye Expedition: Contributions to South American Archeology

Vol. I

The Antiquities of Manabi, Ecuador: A Preliminary Report. By Marshall H. Saville. 1907. $40.00.

Vol. II

The Antiquities of Manabi, Ecuador: Final Report. By Marshall H. Saville. 1910. $25.00.

Contributions from the Museum

Vol. I

No. 1: Lucayan Artifacts from the Bahamas. By Theodoor de Booy. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 1. 50c. (*Out of print.*)

No. 2: Precolumbian Decoration of the Teeth in Ecuador, with some Account of the Occurrence of the Custom in other parts of North and South America. By Marshall H. Saville. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 3. 50c. (*Out of print.*)

No. 3: Certain Kitchen-middens in Jamaica. By Theodoor de Booy. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 3. (*Reprinted, 1919.*) 50c.

No. 4: Porto Rican Elbow-stones in the Heye Museum, with discussion of similar objects elsewhere. By J. Walter Fewkes. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 3. 50c.

No. 5: Note on the Archeology of Chiriqui. By George Grant MacCurdy. Reprinted from *Amer. Anthropol.*, Vol. 15, 1913, No. 4. 50c.

No. 6: Petroglyphs of Saint Vincent, British West Indies. By Thomas Huckerby. Reprinted from *Amer. Anthropol.*, Vol. 16, 1914, No. 2. 50c.

No. 7: Prehistoric Objects from a Shell-heap at Erin Bay, Trinidad. By J. Walter Fewkes. Reprinted from *Amer. Anthropol.*, Vol. 16. 1914, No. 2. 50c.

No. 8: Relations of Aboriginal Culture and Environment in the Lesser Antilles. By J. Walter Fewkes. Reprinted from *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, No. 9. 50c.

No. 9: Pottery from Certain Caves in Eastern Santo Domingo, West Indies. By Theodoor de Booy. Reprinted from *Amer. Anthropol.*, Vol. 17, 1915, No. 1. 50c.

Vol. II

No. 1: Exploration of a Munsee Cemetery near Montague, New Jersey. By George G. Heye and George H. Pepper. 1915. $1.00.
No. 2: Engraved Celts from the Antilles. By J. Walter Fewkes. 1915. 50c.
No. 3: Certain West Indian Superstitions Pertaining to Celts. By Theodoor de Booy. Reprinted from *Journ. Amer. Folk-Lore,* Vol. 28, No. 107, 1915. 50c.
No. 4: The Nanticoke Community of Delaware. By Frank G. Speck. 1915. $1.00.
No. 5: Notes on the Archeology of Margarita Island, Venezuela. By Theodoor de Booy. 1916. 50c.
No. 6: Monolithic Axes and their Distribution in Ancient America. By Marshall H. Saville. 1916. 50c.

Vol. III

Physical Anthropology of the Lenape or Delawares, and of the Eastern Indians in General. By Aleš Hrdlička. (*Bull. 62, Bur. of Amer. Ethnol.,* 1916, with added title-page and cover.) $1.00.

Vol. IV

No. 1: The Technique of Porcupine-quill Decoration among the North American Indians. By William C. Orchard. 1916. $1.00.
No. 2: Certain Archeological Investigations in Trinidad, British West Indies. By Theo-

door de Booy. Reprinted from *Amer. Anthropol.*, Vol. 19, 1917, No. 4. 50c.
No. 3: The Nacoochee Mound in Georgia. By George G. Heye, F. W. Hodge, and George H. Pepper. 1918. $1.50.

VOL. V

No. 1: A Letter of Pedro de Alvarado Relating to His Expedition to Ecuador [1534]. By Marshall H. Saville. 1917. 50c.
No. 2: The Diegueño Ceremony of the Death-images. By E. H. Davis. 1919. 50c.
No. 3: Certain Mounds in Haywood County, North Carolina. By George G. Heye. Reprinted from *Holmes Anniversary Volume*, 1916. 1919. 50c.
No. 4: Exploration of Aboriginal Sites at Throgs Neck and Clasons Point, New York City. By Alanson Skinner. 1919. $1.00.

VOL. VI

Turquois Mosaic Art in Ancient Mexico. By Marshall H. Saville. 1922. $6.00.

VOL. VII

No. 1: Circular Kivas near Hawikuh, New Mexico. (Hendricks-Hodge Expedition.) By F. W. Hodge. $1.50.

Indian Notes and Monographs

VOL. I

No. 1: Archeology of the Virgin Islands. By Theodoor de Booy. 1919. $1.25.

No. 2: Santo Domingo Kitchen-midden and Burial Mound. By Theodoor de Booy. 1919. 50c.
No. 3: Petroglyphs of Grenada and a Recently Discovered Petroglyph in St. Vincent. By Thomas Huckerby. 1921. 50c.
No. 4: Certain Objects from St. Vincent. By Marshall H. Saville. (*In preparation.*)

VOL. II

No. 1: The Pre-Iroquoian Algonkian Indians of Central and Western New York. By Alanson Skinner. 1919. 40c.
No. 2: An Ancient Algonkian Fishing Village at Cayuga, New York. By Alanson Skinner. 1919. 40c.
No. 3: A Montauk Cemetery at Easthampton, Long Island. By Foster H. Saville. 1920. 60c.
No. 4: An Antique Tobacco-pouch of the Iroquois. By Alanson Skinner. 1920. 15c.
No. 5: An Iroquois Antler Figurine. By Alanson Skinner. 1920. 15c.
No. 6: Archeological Investigations on Manhattan Island, New York City. By Alanson Skinner. 1920. $1.50.
No. 7: New York City in Indian Possession. By Reginald Pelham Bolton. 1920. $2.00.

VOL. III

No. 1: Bibliography of Fray Alonso de Benavides. By F. W. Hodge. 1919. 50c.
No. 2: The Age of the Zuñi Pueblo of Kechipauan. By F. W. Hodge. 1920. 40c.

No. 3: Hawikuh Bonework. By F. W. Hodge. 1920. $2.00.

No. 4: The Papago Ceremony of Víkĭta. By Edward H. Davis. 1921. 65c.

Vol. IV

Medicine Ceremony of the Menomini, Iowa, and Wahpeton Dakota, with Notes on the Ceremony among the Ponca, Bungi Ojibwa, and Potawatomi. By Alanson Skinner. 1920. $3.00.

Vol. V

No. 1: Archeological Specimens from New England. By Marshall H. Saville. 1919. 15c.

No. 2: A Mahican Wooden Cup. By George G. Heye. 1921. 20c.

(*Other numbers of Vol. V are to follow.*)

Vol. VI

No. 1: Bibliographic Notes on Quirigua, Guatemala. By Marshall H. Saville. 1919. 25c.

No. 2: The Discovery of Gold in the Graves of Chiriqui. By S. K. Lothrop. 1919. 20c.

No. 3: Notes on the Bribri of Costa Rica. By Alanson Skinner. 1920. $1.50.

No. 4: An Image and an Amulet of Nephrite from Costa Rica. By Alanson Skinner. 1920. 15c.

(*Other numbers of Vol. VI are to follow.*)

Vol. VII

No. 1: Certain Aboriginal Pottery from Southern California. By George G. Heye. 1919. $1.00.

No. 2: Morphological and Metrical Variation in Skulls from San Miguel Island, California. I.—The Sutura Nasofrontalis. By Bruno Oetteking. 1920. 50c.

No. 3: Early Cremation Ceremonies of the Luiseño and Diegueño Indians of Southern California. By E. H. Davis. 1921. 20c.

No. 4: Certain Aboriginal Artifacts from San Miguel Island, California. By George G. Heye. 1921. $4.25.

Vol. VIII

Zuñi Breadstuff. By Frank Hamilton Cushing. 1920. $5.00.

Vol. IX

No. 1: The Earliest Notices Concerning the Conquest of Mexico by Cortés in 1519. By Marshall H. Saville. 1920. 35c.

No. 2: Bibliographic Notes on Uxmal, Yucatan. By Marshall H. Saville. 1921. $1.00.

No. 3: Reports on the Maya Indians of Yucatan. By Santiago Mendez, Antonio García y Cubas, Pedro Sanchez de Aguilar, and Francisco Hernandez. Edited by Marshall H. Saville. 1921. 75c.

Vol. X

No. 1: A Stone Effigy Pipe from Kentucky. By George H. Pepper. 1920. 25c.

No. 2: A Sacred Warclub of the Oto. By M. R. Harrington. 1920. 15c.

No. 3: An Illinois Quilled Necklace. By Alanson Skinner. 1920. 15c.

No. 4: Old Sauk and Fox Beaded Garters. By M. R. Harrington. 1920. 15c.

No. 5: A Bird-quill Belt of the Sauk and Fox. By M. R. Harrington. 1920. 15c.
No. 6: An Archaic Iowa Tomahawk. By M. R. Harrington. 1920. 15c.
No. 7: A Wooden Image from Kentucky. By George H. Pepper. 1921. 30c.

(*Other numbers of Vol. X are to follow.*)

MISCELLANEOUS

(1) A Native Copper Celt from Ontario. By Alanson Skinner. 1920. 15c.
(2) Two Antler Spoons from Ontario. By Alanson Skinner. 1920. 15c.
(3) Two Lenape Stone Masks from Pennsylvania and New Jersey. By Alanson Skinner. 1920. 20c.
(4) Sandals and Other Fabrics from Kentucky Caves. By William C. Orchard. 1920. 30c.
(5) Types of Canoes on Puget Sound. By T. T. Waterman and Geraldine Coffin. 1920. 60c.
(6) How the Makah Obtained Possession of Cape Flattery. By Albert Irvine. Translated by Luke Markistun. 1921. 15c.
(7) The Goldsmith's Art in Ancient Mexico. By Marshall H. Saville. 1920. $3.25.
(8) Native Copper Objects of the Copper Eskimo. By Donald A. Cadzow. 1920. 45c.
(9) Indian Houses of Puget Sound. By T. T. Waterman and Ruth Greiner. 1921. 70c.

(10) Certain Caddo Sites in Arkansas. By M. R. Harrington. 1920. $6.25.

(11) Native Houses of Western North America. By T. T. Waterman and collaborators. 1921. $1.60.

(12) List of Publications of the Museum of the American Indian, Heye Foundation. January, 1921. (*Out of print.*)

(13) Hunting Charms of the Montagnais and the Mistassini. By Frank G. Speck and George G. Heye. 1921. 35c.

(14) Bladed Warclubs from British Guiana. By Marshall H. Saville. 1921. 25c.

(15) Slate Mirrors of the Tsimshian. By George T. Emmons. 1921. 35c.

(16) String-records of the Northwest. By J. D. Leechman and M. R. Harrington. 1921. 75c.

(17) Cuba Before Columbus. Part I. By M. R. Harrington. (Two vols.) 1921. $8.00.

(18) Notes on Iroquois Archeology. By Alanson Skinner. 1921. $3.25.

(19) Religion and Ceremonies of the Lenape. By M. R. Harrington. 1921. $3.50.

(20) Material Culture of the Menomini. By Alanson Skinner. 1921. $6.00.

(21) A Golden Breastplate from Cuzco, Peru. By Marshall H. Saville. 1921. 40c.

(22) Beothuk and Micmac. By Frank G. Speck. 1921. $3.25.

(23) Indian Paths in the Great Metropolis. By Reginald Pelham Bolton. 1922. $4.75.

(24) Cherokee and Earlier Remains on Upper Tennessee River. By M. R. Harrington. 1922. $4.50.

(25) A Report from Natchitoches, in 1807, by Dr John Sibley. Edited, with an introduction, by A. H. Abel. 1922. $1.00.

(26) Additional Mounds of Duval and of Clay Counties, Florida. By Clarence B. Moore. 1922. 65c.

(27) Aboriginal Pottery of Costa Rica. By S. K. Lothrop. (*In preparation.*)

(28) List of Publications of the Museum of the American Indian, Heye Foundation. Second Edition. September, 1921. (*Out of print.*)

(29) A Basket-maker Cave in Kane County, Utah. By Jesse L. Nusbaum, with Notes on the Artifacts by A. V. Kidder and S. J. Guernsey. 1922. $2.50.

(30) Guide to the Museum. First Floor. 1922. 35c.

(31) Guide to the Museum. Second Floor. 1922. 35c.

(32) Guide to the Collections from the West Indies. 1922. 15c.

(33) Aims and Objects of the Museum of the American Indian, Heye Foundation. 1922. (*Free.*)

(34) List of Publications of the Museum of the American Indian, Heye Foundation. Third Edition. December, 1922. (*Out of print.*)

(35) Jade in British Columbia and Alaska, and its Use by the Natives. By G. T. Emmons. 1923. $5.00.

(36) List of Publications of the Museum of the American Indian, Heye Foundation. Fourth Edition. March, 1924. (*Free.*)

Indian Notes

"Published occasionally in the interest of the Museum." This little publication will appear four times a year, but not necessarily at regular intervals. Subscription price, $1.00 a year, 25c a copy. Specimen copy on request.

Leaflets

1. A Sculptured Vase from Guatemala. By Marshall H. Saville. 1919. $1.50.
2. Turquois Work of Hawikuh, New Mexico. By F. W. Hodge. 1921. $3.00.

INDEX OF AUTHORS AND TITLES

(C = Contributions from the Museum. SA = Contributions to South American Archeology INM = Indian Notes and Monographs. L = Leaflet.)

Abel, A. H., editor, A report from Natchitoches, in 1807, by Dr. John Sibley........ INM, Misc. (25)
Aboriginal artifacts from San Miguel island, California (Heye).................. INM, vii, 4
Aboriginal culture and environment in the Lesser Antilles (Fewkes)................ C, i, 8
——— see *Culture*
Aboriginal pottery from southern California (Heye)...... INM, vii, 1
——— of Costa Rica (Lothrop)..................... INM, Misc. (27)
Aboriginal sites at Throgs neck and Clasons point, New York City (Skinner)....... C, v, 4
Additional mounds of Duval and of Clay counties, Florida (Moore)................. INM, Misc. (26)
Age of the Zuñi pueblo of Kechipauan (Hodge)...... INM, iii, 2
Aims and objects of the Museum..................... INM, Misc. (33)

Alaska, jade in (Emmons).... INM, Misc. 35
Algonkian fishing village at Cayuga, New York (Skinner)........................ INM, II, 2
——— Indians of central and western New York (Skinner) INM, II, 1
Alvarado, Pedro de, letter of (Saville).................. C, V, 1
Amulet of nephrite from Costa Rica (Skinner)............ INM, VI, 4
Ancient Algonkian fishing village at Cayuga, New York (Skinner).................. INM, II, 2
Anthropology, see *Physical anthropology*
Antilles, engraved celts from (Fewkes)................. C, II, 2
———, see *Lesser Antilles*, *West Indian*
Antique tobacco-pouch of the Iroquois (Skinner).......... INM, II, 4
Antiquities of Manabi, Ecuador (Saville).................. SA, I, II
Antler figurine of the Iroquois (Skinner)................. INM, II, 5
——— spoons from Ontario (Skinner)................. INM, Misc. (2)
Archaic Iowa tomahawk (Harrington).................. INM, X, 6
Archeological investigations in Trinidad (de Booy)........ C, IV, 2
——— investigations on Manhattan island (Skinner)..... INM, II, 6
——— specimens from New England (Saville).......... INM, V, 1

Archeology, Iroquois, notes on (Skinner)	INM, Misc. (18)
—— of Chiriqui (MacCurdy)	C, I, 5
—— of Margarita island, Venezuela (de Booy)	C, II, 5
—— of the Virgin islands (de Booy)	INM, I, 1
Arkansas, certain Caddo sites in (Harrington)	INM, Misc. (10)
Axes, monolithic, in ancient America (Saville)	C, II, 6

Bahamas, Lucayan artifacts from the (de Booy)	C, I, 1
Basket-maker cave in Kane county, Utah (Nusbaum, Kidder, Guernsey)	INM, Misc. (29)
Beaded garters of the Sauk and Fox (Harrington)	INM, X, 4
Belt, bird-quill, of the Sauk and Fox (Harrington)	INM, X, 5
Benavides, Fray Alonso de, bibliography of (Hodge)	INM, III, 1
Beothuk and Micmac (Speck)	INM, Misc. (22)
Bibliographic notes on Quirigua, Guatemala (Saville)	INM, VI, 1
—— on Uxmal, Yucatan (Saville)	INM, IX, 2
Bibliography of Fray Alonso de Benavides (Hodge)	INM, III, 1
Bird-quill belt of the Sauk and Fox (Harrington)	INM, X, 5
Bladed warclubs from British Guiana (Saville)	INM, Misc. (14)

Bolton, Reginald Pelham, Indian paths in the Great Metropolis	INM, Misc. (23)
———, New York City in Indian possession	INM, II, 7
Bonework, Hawikuh (Hodge)	INM, III, 3
Booy, Theodoor de, Archeology of the Virgin Islands	INM, I, 1
———, Certain archeological investigations in Trinidad	C, IV, 2
——— Certain kitchen-middens in Jamaica	C, I, 3
———, Certain West Indian superstitions pertaining to celts	C, II, 3
———, Lucayan artifacts from the Bahamas	C, I, 1
———, Notes on the archeology of Margarita island, Venezuela	C, II, 5
———, Pottery from certain caves in eastern Santo Domingo	C, I, 9
———, Santo Domingo kitchen-midden and burial mound	INM, I, 2
Breadstuff, Zuñi (Cushing)	INM, VIII
Breastplate, golden, from Cuzco, Peru (Saville)	INM, Misc. (21)
Bribri of Costa Rica (Skinner)	INM, VI, 3
British Columbia, jade in (Emmons)	INM, Misc. 35
British Guiana, bladed war-clubs from (Saville)	INM, Misc. (14)
Bungi Ojibwa, medicine ceremony of the (Skinner)	INM, IV

Burial customs of southern California (Davis)	INM, VII, 3
Burial mound in Santo Domingo (de Booy)	INM, I, 2
Caddo sites in Arkansas (Harrington)	INM, Misc. (10)
Cadzow, Donald A., Native copper objects of the Copper Eskimo	INM, Misc. (8)
California, aboriginal objects from San Miguel island (Heye)	INM, VII, 4
———, aboriginal pottery from (Heye)	INM, VII, 1
———, early cremation ceremonies of (Davis)	INM, VII, 3
———, skulls from San Miguel island (Oetteking)	INM, VII, 2
Canoes, types of, on Puget sound (Waterman and Coffin)	INM, Misc. (5)
Cape Flattery, how obtained by the Makah (Irvine)	INM, Misc. (6)
Cave, Basket-maker, in Utah (Nusbaum, Kidder, Guernsey)	INM, Misc. (29)
Caves, Kentucky, sandals and other fabrics from (Orchard)	INM, Misc. (4)
———, pottery from, in Santo Domingo (de Booy)	C, I, 9
Cayuga, New York, ancient Algonkian fishing village at (Skinner)	INM, II, 2
Celt, copper, from Ontario (Skinner)	INM, Misc. (1)

Celts, engraved, from the Antilles (Fewkes)............ C, II, 2
———, West Indian superstitions pertaining to (de Booy) C, II, 3
Cemetery, Montauk, at Easthampton, Long Island (Foster H. Saville)............ INM, II, 3
———, Munsee, exploration of (Heye and Pepper)........ C, II, 1
Ceremonies, religion and, of the Lenape (Harrington)...... INM, Misc.(19)
Ceremony, Diegueño, of the death-images (Davis)...... C, V, 2
———, medicine, of the Menomini (Skinner).......... INM, IV
———, Papago, of Víkĭta (Davis).................... INM, III, 4
Certain aboriginal artifacts from San Miguel island (Heye). INM, VII, 4
——— aboriginal pottery from southern California (Heye). INM, VII, 1
——— archeological investigations in Trinidad (de Booy).................... C, IV, 2
——— Caddo sites in Arkansas (Harrington).......... INM, Misc. (10)
——— kitchen-middens in Jamaica (de Booy)........ C, I, 3
——— mounds in Haywood county, North Carolina (Heye).................... C, V, 3
——— objects from Saint Vincent (Saville).......... INM, I, 4
——— West Indian superstitions pertaining to celts (de Booy).................... C, II, 3

Charms, hunting, of the Montagnais and the Mistassini (Speck and Heye) . . . . INM, Misc. (13)
Cherokee and earlier remains on upper Tennessee river (Harrington) . . . . INM, Misc. (24)
Chiriqui, gold in graves of (Lothrop) . . . . INM, vi, 2
Circular kivas, near Hawikuh, N. Mex. (Hodge) . . . . C, vii, 1
Clasons point, aboriginal sites at (Skinner) . . . . C, v, 4
Coffin, Geraldine, see *Waterman, T. T., and Coffin*
Columbus, Cuba before, Part I. (Harrington) . . . . INM, Misc. (17)
Conquest of Mexico, notices concerning (Saville) . . . . INM, ix, 1
Copper celt from Ontario (Skinner) . . . . INM, Misc. (1)
——— objects of the Copper Eskimo (Cadzow) . . . . INM, Misc. (8)
Copper Eskimo, native copper objects of (Cadzow) . . . . INM, Misc. (8)
Cortés, notices concerning conquest of Mexico by (Saville) INM, ix, 1
Costa Rica, aboriginal pottery of (Lothrop) . . . . INM, Misc. (27)
———, image and amulet of nephrite from (Skinner) . . . . INM, vi, 4
———, notes on the Bribri of (Skinner) . . . . INM vi, 3
Cremation ceremonies of southern California (Davis) . . . . . INM, vii, 3
Cuba before Columbus, Part I. (Harrington) . . . . INM, Misc. (17)

Culture and environment in the Lesser Antilles (Fewkes) C, I, 8
Culture, material, of the Menomini (Skinner) .... INM, Misc. (20)
Cup, wooden, of the Mahican (Heye) .... INM, V, 2
Cushing, F. H., Zuñi breadstuff .... INM, VIII
Cuzco, golden breastplate from (Saville) .... INM, Misc. (21)

Dakota, see *Wahpeton*
Davis, E. H., Early cremation ceremonies of southern California .... INM, VII, 3
———, The Diegueño ceremony of the death-images .... C, V, 2
———, The Papago ceremony of Víkĭta .... INM, III, 4
Death-images, Diegueño ceremony of the (Davis) ...... C, V, 2
Decoration of teeth in Ecuador (Saville) .... C, I, 2
———, see *Porcupine-quill decoration*
Delaware, Nanticoke community of (Speck) .... C, II, 4
Delaware Indians, see *Lenape*
Diegueño ceremony of the death-images (Davis) ...... C, V, 2
——— cremation ceremonies (Davis) .... INM, VII, 3
Discovery of gold in the graves of Chiriqui (Lothrop) ...... INM, VI, 2

Earliest notices concerning the conquest of Mexico by Cortés in 1519 (Saville)	INM, IX, 1
Early cremation ceremonies of southern California (Davis)	INM, VII, 3
Easthampton, Long Island, Montauk cemetery at (Foster H. Saville)	INM, II, 3
Ecuador, antiquities of Manabi (Saville)	SA, I, II
———, letter of Pedro de Alvarado, relating to his expedition to (Saville)	C, V, 1
———, precolumbian decoration of teeth in (Saville)	C, I, 2
Effigy pipe from Kentucky (Pepper)	INM, X, 1
Elbow-stones, Porto Rican (Fewkes)	C, I, 4
Emmons, G. T., Jade in British Columbia and Alaska	INM, Misc. 35
———, Slate mirrors of the Tsimshian	INM, Misc.(15)
Engraved celts from the Antilles (Fewkes)	C, II, 2
Environment, relations of aboriginal culture and, in the Lesser Antilles (Fewkes)	C, I, 8
Eskimo, see *Alaska*, *Copper Eskimo*	
Exploration of aboriginal sites at Throgs neck and Clasons point, New York City (Skinner)	C, V, 4
——— of a Munsee cemetery near Montague, New Jersey (Heye and Pepper)	C, II, 1

Exploration, see *Archeological investigations*
Fabrics from Kentucky caves (Orchard) . . . . INM, Misc. (4)
Fewkes, J. W., Engraved celts from the Antilles . . . . C, II, 2
———, Porto Rican elbow-stones . . . . C, I, 4
———, Prehistoric objects from a shell-heap at Erin bay, Trinidad . . . . C, I, 7
———, Relations of aboriginal culture and environment in the Lesser Antilles . . . . C, I, 8
Figurine, antler, of the Iroquois (Skinner) . . . . INM, II, 5
Fishing village, Algonkian, at Cayuga, New York (Skinner) . . . . INM, II, 2
Florida, mounds of Duval and of Clay counties (Moore) . . . INM, Misc. (26)
Fox, see *Sauk and Fox*

García y Cubas, Antonio, The Maya Indians of Yucatan in 1861 . . . . INM, IX, 3
Garters, beaded, of the Sauk and Fox (Harrington) . . . . . INM, X, 4
Georgia, Nacoochee mound in (Heye, Hodge, Pepper) . . . . . C, IV, 3
Gold in graves of Chiriqui (Lothrop) . . . . INM, VI, 2
Golden breastplate from Cuzco, Peru (Saville) . . . . INM, Misc. (21)
Goldsmith's art in ancient Mexico (Saville) . . . . INM, Misc. (7)

Graves, discovery of gold in, of Chiriqui (Lothrop)	INM, VI, 2
Greiner, Ruth, see *Waterman, T. T., and Greiner*	
Grenada, petroglyphs of (Huckerby)	INM, I, 3
Guatemala, bibliographic notes on Quirigua (Saville)	INM, VI, 1
———, sculptured vase from (Saville)	L, 1
Guernsey, S. J., see *Kidder, A. V., and Guernsey*	
Guide to the Museum. First floor	INM, Misc. (30)
Guide to the Museum. Second floor	INM, Misc. (31)
Guide to the collections from the West Indies	INM, Misc. (32)
Harrington, M. R., A bird-quill belt of the Sauk and Fox	INM, X, 5
———, A sacred warclub of the Oto	INM, X, 2
———, An archaic Iowa tomahawk	INM, X, 6
———, Certain Caddo sites in Arkansas	INM, Misc. (10)
———, Cherokee and earlier remains on upper Tennessee river	INM, Misc. (24)
———, Cuba before Columbus, Part I	INM, Misc. (17)
———, Old Sauk and Fox beaded garters	INM, X, 4

Harrington, M. R., Religion and ceremonies of the Lenape...	INM, Misc. (19)
———, see *Leechman, J. D., and Harrington*	
Hawikuh bonework (Hodge)..	INM, III, 3
———, Circular kivas near (Hodge)..................	C, VII, 1
———, Turquois work of (Hodge)	L, 2
Hernandez, Francisco, Of the religious beliefs of the Indians of Yucatan in 1545...	INM, IX, 3
Heye, George G., A Mahican wooden cup...............	INM, V, 2
———, Certain aboriginal artifacts from San Miguel island	INM, VII, 4
———, Certain aboriginal pottery from southern California......................	INM, VII, 1
———, Certain mounds in Haywood county, North Carolina..................	C, V, 3
———, *and Pepper, G. H.*, Exploration of a Munsee cemetery near Montague, New Jersey......................	C, II, 1
———, *Hodge, F. W., and Pepper, G. H.*, The Nacoochee mound in Georgia.	C, IV, 3
———, see *Speck, Frank G., and Heye*	
Hodge, F. W., Age of the Zuñi pueblo of Kechipauan.....	INM, III, 2
———, Bibliography of Fray Alonso de Benavides......	INM, III, 1

Hodge, F. W., Circular kivas near Hawikuh, N. Mex.	C, vii, 1
———, Hawikuh bonework	INM, iii, 3
———, Turquois work of Hawikuh	L, 2
———, see *Heye, George G., Hodge, F. W., and Pepper, G. H.*	
Houses, Indian, of Puget sound (Waterman and Greiner)	INM, Misc. (9)
———, native, of western North America (Waterman and collaborators)	INM, Misc. (11)
How the Makah obtained possession of Cape Flattery (Irvine)	INM, Misc. (6)
Hrdlička, A., Physical anthropology of the Lenape or Delawares, and of the eastern Indians in general	C, iii
Huckerby, Thomas, Petroglyphs of Grenada and a recently discovered petroglyph in St. Vincent	INM, i, 3
———, Petroglyphs of St Vincent	C, i, 6
Hunting charms of the Montagnais and the Mistassini (Speck and Heye)	INM, Misc. (13)
Illinois quilled necklace (Skinner)	INM, x, 3
Image and amulet of nephrite from Costa Rica (Skinner)	INM, vi, 4
———, wooden, from Kentucky (Pepper)	INM, x, 7

Image, see *Death-images*
Indian houses of Puget sound (Waterman and Greiner) . . . INM, Misc. (9)
——— paths in the Great Metropolis (Bolton) . . . . INM, Misc. (23)
——— possession of New York City (Bolton) . . . . INM, II, 7
Iowa, archaic tomahawk of the (Harrington) . . . . INM, X, 6
———, medicine ceremony of the (Skinner) . . . . INM, IV
Iroquois, antler figurine of the (Skinner) . . . . INM, II, 5
——— archeology, notes on (Skinner) . . . . INM, Misc. (18)
———, tobacco-pouch of the (Skinner) . . . . INM, II, 4
Irvine, Albert, How the Makah obtained possession of Cape Flattery . . . . INM, Misc. (6)

Jade in British Columbia and Alaska (Emmons) . . . . INM, Misc. 35
Jamaica, kitchen-middens in (de Booy) . . . . C, I, 3

Kechipauan, age of Zuñi pueblo of (Hodge) . . . . INM, III, 2
Kentucky, sandals and other fabrics from caves in (Orchard) . . . . INM, Misc. (4)
———, stone effigy pipe from (Pepper) . . . . INM, X, 1

Kentucky, wooden image from (Pepper)	INM, x, 7
Kidder, A. V., and Guernsey, S. J., Artifacts from Basket-maker cave in Utah	INM, Misc. (29)
Kitchen-midden and burial-mound in Santo Domingo (de Booy)	INM, i, 2
——— in Jamaica (de Booy)	C, i, 3
Kivas, circular, near Hawikuh, N. Mex. (Hodge)	C, vii, 1
Leechman, J. D., and Harrington, M. R., String-records of the Northwest	INM, Misc. (16)
Lenape, physical anthropology of the (Hrdlička)	C, iii
———, religion and ceremonies of the (Harrington)	INM, Misc. (19)
———, stone masks of the (Skinner)	INM, Misc. (3)
Letter of Pedro de Alvarado (Saville)	C, v, 1
Lothrop, S. K., Aboriginal pottery of Costa Rica	INM, Misc. (27)
———, The discovery of gold in the graves of Chiriqui	INM, vi, 2
Lucayan artifacts from the Bahamas (de Booy)	C, i, 1
Luiseño cremation ceremonies (Davis)	INM, vii, 3
MacCurdy, G. G., Note on the archeology of Chiriqui	C, i, 5
Mahican wooden cup (Heye)	INM, v, 2
Makah obtained possession of Cape Flattery (Irvine)	INM, Misc. (6)

Manabi, antiquities of (Saville) .... SA, I, II
Manhattan Island, archeological investigations on (Skinner) .... INM, II, 6
———, see *New York City*
Margarita island, Venezuela, archeology of (de Booy) .... C, II, 5
Markistun, Luke, translator, How the Makah obtained possession of Cape Flattery (Irvine) .... INM, Misc. (6)
Masks, stone, of the Lenape (Skinner) .... INM, Misc. (3)
Material culture of the Menomini (Skinner) .... INM, Misc.(20)
Maya Indians of Yucatan (Saville, *ed.*) .... INM, IX, 3
Medicine ceremony of the Menomini, (Skinner) .... INM, IV
Mendez, Santiago, The Maya Indians of Yucatan in 1861 INM, IX, 3
Menomini, material culture of the (Skinner) .... INM, Misc. (20)
———, medicine ceremony of the (Skinner) .... INM, IV
Metrical variation in skulls from San Miguel island, California (Oetteking) .... INM, VII, 2
Mexico, ancient, goldsmith's art in (Saville) .... INM, Misc. (7)
———, ancient, turquois mosaic art in (Saville) ...... C, VI
———, conquest of, notices concerning (Saville) .... INM, IX, 1

Mexico, see *Yucatan*	
Micmac, Beothuk and (Speck)	INM, Misc.(22)
Mirrors, slate, of the Tsimshian (Emmons)	INM, Misc.(15)
Mistassini, hunting charms of the (Speck and Heye)	INM, Misc.(13)
Monolithic axes and their distribution in ancient America (Saville)	C, II, 6
Montagnais, hunting charms of the (Speck and Heye)	INM, Misc.(13)
Montauk cemetery at Easthampton, Long Island (Foster H. Saville)	INM, II, 3
Moore, Clarence B., Additional mounds of Duval and of Clay counties, Florida	INM, Misc.(26)
Morphological and metrical variation in skulls from San Miguel island, California (Oetteking)	INM, VII, 2
Mosaic, see *Turquois*	
Mound, Nacoochee, in Georgia (Heye, Hodge, Pepper)	C, IV, 3
———, see *Burial mound*	
Mounds in Haywood county, North Carolina (Heye)	C, V, 3
——— of Duval and of Clay counties, Florida (Moore)	INM, Misc.(26)
Munsee cemetery, exploration of (Heye and Pepper)	C, II, 1
Nacoochee mound in Georgia (Heye, Hodge, Pepper)	C, IV, 3
Nanticoke community of Delaware (Speck)	C, II, 4

Natchitoches, report from, in 1807 (Abel, *ed.*) .... INM, Misc. (25)
Native copper celt from Ontario (Skinner) .... INM, Misc. (1)
——— copper objects of the Copper Eskimo (Cadzow) .. INM, Misc. (8)
———houses of western North America (Waterman and collaborators) .... INM, Misc. (11)
Necklace, quilled, of the Illinois (Skinner) .... INM, x, 3
Nephrite, image and amulet of, from Costa Rica (Skinner) . INM, vi, 4
New England, archeological specimens from (Saville) ... INM, v, 1
Newfoundland, see *Beothuk*
New Jersey, Lenape stone masks from (Skinner) ..... INM, Misc. (3)
———, Munsee cemetery in (Heye and Pepper) .... C, ii, 1
New Mexico, see *Hawikuh*, *Kechipauan*, *Zuñi*
New York, ancient Algonkian fishing village at Cayuga (Skinner) .... INM, ii, 2
New York City, exploration of sites in (Skinner) .... C, v, 4
——— in Indian possession (Bolton) .... INM, ii, 7
———, Indian paths in (Bolton) .... INM, Misc. (23)
———, see *Manhattan Island*, *Throgs neck*
North America, western, native houses of (Waterman and collaborators) .... INM, Misc. (11)

North Carolina, mounds in Haywood county (Heye) . . .	C, V, 3
Northwest, String-records of the (Leechman and Harrington)	INM, Misc.(16)
———, see *Puget sound*	
Notes on Iroquois archeology (Skinner)	INM, Misc.(18)
——— on the archeology of Chiriqui (MacCurdy)	C, I, 5
——— on the archeology of Margarita island, Venezuela (de Booy)	C, II, 5
——— on the Bribri of Costa Rica (Skinner)	INM, VI, 3
Nusbaum, J. L., Basket-maker cave in Kane county, Utah . .	INM, Misc.(29)
Objects, certain, from St Vincent (Saville)	INM, I, 4
——— of copper of the Copper Eskimo (Cadzow)	INM, Misc. (8)
Oetteking, Bruno, Morphological and metrical variation in skulls from San Miguel island, California. I—The Sutura nasofrontalis	INM, VII, 2
Ojibwa, see *Bungi Ojibwa*	
Old Sauk and Fox beaded garters (Harrington)	INM, X, 4
Ontario, antler spoons from (Skinner)	INM, Misc. (2)
———, native copper celt from (Skinner)	INM, Misc. (1)
Orchard, W. C., Sandals and other fabrics from Kentucky caves	INM, Misc. (4)

Orchard, W. C, The technique of porcupine-quill decoration among the North American Indians .... C, IV, 1
Oto, sacred warclub of the (Harrington) .... INM, x, 2

Panama, see *Chiriqui*
Papago ceremony of Víkĭta (Davis) .... INM, III, 4
Paths, Indian, in the Great Metropolis (Bolton) .... INM, Misc.(23)
Pennsylvania, Lenape stone masks from (Skinner) ...... INM, Misc. (3)
Pepper, G. H., A stone effigy pipe from Kentucky .... INM, x, 1
———, A wooden image from Kentucky .... INM, x, 7
———, see *Heye, George G., and Pepper*, also *Heye, George G., Hodge, F. W., and Pepper*
Peru, golden breastplate from Cuzco (Saville) .... INM, Misc.(21)
Petroglyphs of Grenada and St Vincent (Huckerby) .... INM, I, 3
——— of St Vincent (Huckerby) .... C, I, 6
Physical anthropology of the Lenape or Delawares (Hrdlička) .... C, III
———, see *Skulls*
Pictographs, see *Petroglyphs*
Ponca, medicine ceremony of the (Skinner) .... INM, IV

Porcupine-quill decoration among the North American Indians (Orchard)	C, IV, 1
Porto Rican elbow-stones (Fewkes)	C, I, 4
Potawatomi, medicine ceremony of the (Skinner)	INM, IV
Pottery, aboriginal, from southern California (Heye)	INM, VII, 1
———, aboriginal, of Costa Rica (Lothrop)	INM, Misc. (27)
——— from caves in Santo Domingo (de Booy)	C, I, 9
Precolumbian decoration of the teeth in Ecuador (Saville)	C, I, 2
Prehistoric objects from Trinidad (Fewkes)	C, I, 7
Pre-Iroquoian Algonkian Indians of central and western New York (Skinner)	INM, II, 1
Puget sound, Indian houses of (Waterman and Greiner)	INM, Misc. (9)
———, types of canoes on (Waterman and Coffin)	INM, Misc. (5)
Quill, see *Bird-quill*, *Porcupine-quill*	
Quilled necklace of the Illinois (Skinner)	INM, X, 3
Quirigua, bibliographic notes on (Saville)	INM, VI, 1
Records, string, of the Northwest (Leechman and Harrington)	INM, Misc. (16)

Relations of aboriginal culture and environment in the Lesser Antilles (Fewkes).... C, i, 8
Religion and ceremonies of the Lenape (Harrington)...... INM, Misc. (19)
Report from Natchitoches, in 1807, by Dr John Sibley (Abel, *ed.*)................. INM, Misc. (25)
Reports on the Maya Indians of Yucatan (Saville, *ed.*)...... INM, IX, 3

Sacred warclub of the Oto (Harrington)............. INM, x, 2
Saint Vincent, certain objects from (Saville)............. INM, i, 4
———, petroglyphs of (Huckerby).................... C, i, 6; INM, i, 3
Sanchez de Aguilar, Pedro, Notes on the superstitions of the Indians of Yucatan (1639).................. INM, ix, 3
Sandals from Kentucky caves (Orchard)................. INM, Misc. (4)
San Miguel island, California, aboriginal artifacts from (Heye)................... INM, vii, 4
——— skulls from (Oetteking) INM, vii, 2
Santo Domingo kitchen-midden and burial mound (de Booy) INM, i, 2
———, pottery from caves in (de Booy)................ C, i, 9
Sauk and Fox, beaded garters of (Harrington)........... INM, x, 4

Sauk and Fox, bird-quill belt of (Harrington)	INM, x, 5
Saville, Foster H., A Montauk cemetery at Easthampton, Long Island	INM, ii, 3
Saville, Marshall H., A golden breastplate from Cuzco, Peru	INM, Misc. (21)
———, A letter of Pedro de Alvarado, relating to his expedition to Ecuador	C, v, 1
———, Antiquities of Manabi, Ecuador	SA, i, ii
———, Archeological specimens from New England	INM, v, 1
———, A sculptured vase from Guatemala	L, 1
———, Bibliographic notes on Quirigua, Guatemala	INM, vi, 1
———, Bibliographic notes on Uxmal, Yucatan	INM, ix, 2
———, Bladed warclubs from British Guiana	INM, Misc. (14)
———, Certain objects from St Vincent	INM, i, 4
———, Monolithic axes and their distribution in ancient America	C, ii, 6
———, Precolumbian decoration of teeth in Ecuador	C, i, 2
———, The earliest notices concerning the conquest of Mexico by Cortés in 1519	INM, ix, 1
———, The goldsmith's art in ancient Mexico	INM, Misc. (7)

Saville, Marshall H., Turquois art mosaic in ancient Mexico C, VI
———, *editor*, Reports on the Maya Indians of Yucatan.. INM, IX, 3
Sculptured vase from Guatemala (Saville)................ L, 1
Shell-heap, prehistoric objects from, in Trinidad (Fewkes). C, I, 7
Sibley, John, A report from Natchitoches in 1807....... INM, Misc.(25)
Sites, Caddo, in Arkansas (Harrington).................... INM, Misc.(10)
Skinner, Alanson, A native copper celt from Ontario... INM, Misc. (1)
———, An ancient Algonkian fishing village at Cayuga, New York................ INM, II, 2
———, An antique tobacco-pouch of the Iroquois...... INM, II, 4
———, An Illinois quilled necklace................. INM, X, 3
———, An image and an amulet of nephrite from Costa Rica...................... INM, VI, 4
———, An Iroquois antler figurine..................... INM, II, 5
———, Archeological investigations on Manhattan Island. INM, II, 6
———, Exploration of aboriginal sites at Throgs neck and Clasons point, New York City..................... C, V, 4
———, Material culture of the Menomini................ INM, Misc.(20)

Skinner, Alanson, Medicine ceremony of the Menomini.	INM, IV
———, Notes on Iroquois archeology	INM, Misc.(18)
———, Notes on the Bribri of Costa Rica	IMN, VI, 3
———, The pre-Iroquoian Algonkian Indians of central and western New York	INM, II, 1
———, Two antler spoons from Ontario	INM, Misc. (2)
———, Two Lenape stone masks from Pennsylvania and New Jersey	INM, Misc. (3)
Skulls from San Miguel island, California (Oetteking)	INM, VII, 2
———, *see Physical anthropology*	
Slate mirrors of the Tsimshian (Emmons)	INM, Misc.(15)
Speck, Frank G., Beothuk and Micmac	INM, Misc.(22)
——— The Nanticoke community of Delaware	C, II, 4
———, *and Heye, George G.,* Hunting charms of the Montagnais and the Mistassini	INM, Misc.(13)
Spoons, antler, from Ontario (Skinner)	INM, Misc. (2)
Stone effigy pipe from Kentucky (Pepper)	INM, X, 1
——— masks of the Lenape (Skinner)	INM, Misc. (3)
String-records of the Northwest (Leechman and Harrington).	INM, Misc.(16)

Superstitions, West Indian, pertaining to celts (de Booy). C, II, 3
Sutura nasofrontalis (Oetteking) .... INM, VII, 2

Technique of porcupine-quill decoration (Orchard) ...... C, IV, 1
Teeth, decoration of, in Ecuador (Saville) .... C, I, 2
Tennessee river, Cherokee and earlier remains on (Harrington) .... INM, Misc. (24)
Throgs neck, aboriginal sites at (Skinner) .... C, V, 4
Tobacco-pouch of the Iroquois (Skinner) .... INM, II, 4
Tomahawk, archaic, of the Iowa (Harrington) .... INM, X, 6
Trinidad, archeological investigations in (de Booy) ...... C, IV, 2
———, prehistoric objects from a shell-heap in (Fewkes) ..... C, I, 7
Tsimshian, slate mirrors of the (Emmons) .... INM, Misc. (15)
Turquois mosaic art in ancient Mexico (Saville) .... C, VI
——— work of Hawikuh (Hodge) .... L, 2
Types of canoes on Puget sound (Waterman and Coffin) .... INM, Misc. (5)

Utah, Basket-maker cave in (Nusbaum, Kidder, Guernsey) .... INM, Misc. (29)

Uxmal, bibliographic notes on (Saville)	INM, IX, 2
Vase, sculptured, from Guatemala (Saville)	L, 1
Venezuela, see *Margarita island*	
Vikĭta, Papago ceremony of (Davis)	INM, III, 4
Virgin islands, archeology of (de Booy)	INM, I, 1
Wahpeton, medicine ceremony of the (Skinner)	INM, IV
Warclub, sacred, of the Oto (Harrington)	INM, X, 2
Warclubs, bladed, from British Guiana (Saville)	INM, Misc. (14)
Washington, see *Puget sound*	
Waterman, T. T., and Coffin, Geraldine, Types of canoes on Puget sound	INM, Misc. (5)
——— *and collaborators*, Native houses of western North America	INM, Misc. (11)
——— *and Greiner, Ruth*, Indian houses of Puget sound.	INM, Misc. (9)
West Indian superstitions pertaining to celts (de Booy)	C, II, 3
West Indies, see *Bahamas, Grenada, Guide, Jamaica, Lesser Antilles, Saint Vincent, Santo Domingo, Trinidad, Virgin islands*	
Wooden image from Kentucky (Pepper)	INM, X, 7

Yucatan, bibliographic notes on Uxmal (Saville)........ INM, IX, 2
———, reports concerning the Maya Indians of (Saville, *ed.*). INM, IX, 3

Zuñi breadstuff (Cushing).... INM, VIII
——— pueblo of Kechipauan (Hodge).................. INM, III, 2
———, see *Hawikuh*

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 38

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

GUIDE TO THE MUSEUM

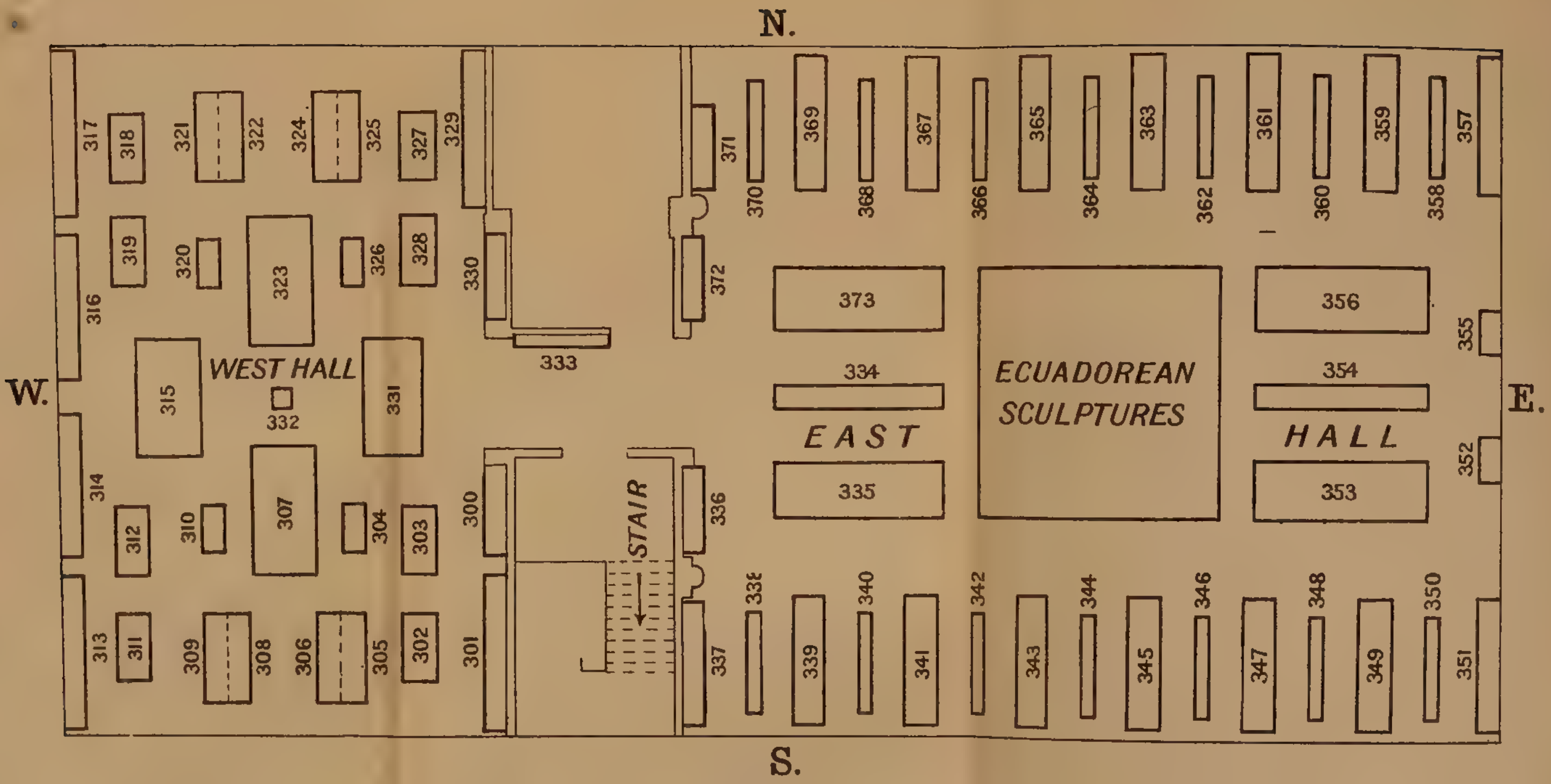
THIRD FLOOR

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
1924

THIS series of INDIAN NOTES AND MONOGRAPHS is devoted primarily to the publication of the result of studies by members of the staff of the Museum of the American Indian, Heye Foundation, and is uniform with HISPANIC NOTES AND MONOGRAPHS, published by the Hispanic Society of America, with which organization this Museum is in cordial coöperation.

Only the first ten volumes of INDIAN NOTES AND MONOGRAPHS are numbered. The unnumbered parts may readily be determined by consulting the List of Publications issued as one of the series.

GUIDE TO THE COLLECTIONS
FROM
MIDDLE AND SOUTH AMERICA
AND THE WEST INDIES



PLAN OF THIRD FLOOR

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 38

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

GUIDE TO THE MUSEUM

THIRD FLOOR

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
1924

CONTENTS

WEST HALL—ARCHEOLOGY OF MIDDLE AMERICA AND THE WEST INDIES

PAGE

Archeology of Middle America in General............ 9
  Ancient Mexico.............................. 25
    North Mexican Culture...................... 25
    Tarascan Culture........................... 25
    Nahuan or Mexican Culture.................. 28
    Mixtecan-Zapotecan Culture................. 32
    Totonacan Culture.......................... 35
    Huaxtecan-Mayan Culture.................... 37
  Yucatan Peninsula............................ 42
  British Honduras............................. 44
  Guatemala.................................... 44
  Honduras..................................... 49
  Salvador..................................... 50
  Nicaragua.................................... 53
  Mosquitia.................................... 56
Archeology of the West Indies.................. 57
  Native Population............................ 57
    The Taino tribes........................... 59
    The Ciboney................................ 62
    The Carib.................................. 64
  Cuba... 65
  Jamaica...................................... 68
  Bahamas...................................... 69
  Santo Domingo................................ 70
  Porto Rico................................... 71
  Virgin Islands............................... 73

Other Islands........................... 74
Guadaloupe and Dominica.................. 74
Martinique............................. 75
Santa Lucia............................ 75
Montserrat............................. 75
Saint Vincent.......................... 76
Grenadines............................. 77
Grenada................................ 78
Trinidad............................... 78
Tobago................................. 79
Barbados............................... 79

EAST HALL—ARCHEOLOGY OF MIDDLE AMERICA AND SOUTH AMERICA

Costa Rica................................ 81
Panama.................................... 84
Archeology of South America.................. 86
Colombia.................................. 86
Andean Region........................... 86
Pacific Coast Region.................... 90
Ecuador................................... 91
Andean Region........................... 93
Pacific Coast Region.................... 99
Esmeraldas Culture.................... 103
Manabí Culture........................ 106
The Guianas and Venezuela.................. 109
Brazil.................................... 111
Peru...................................... 114
Chile..................................... 125
Argentine................................. 128

WEST HALL AND STAIRWAY HALL—ETHNOLOGY OF MIDDLE AMERICA AND THE WEST INDIES

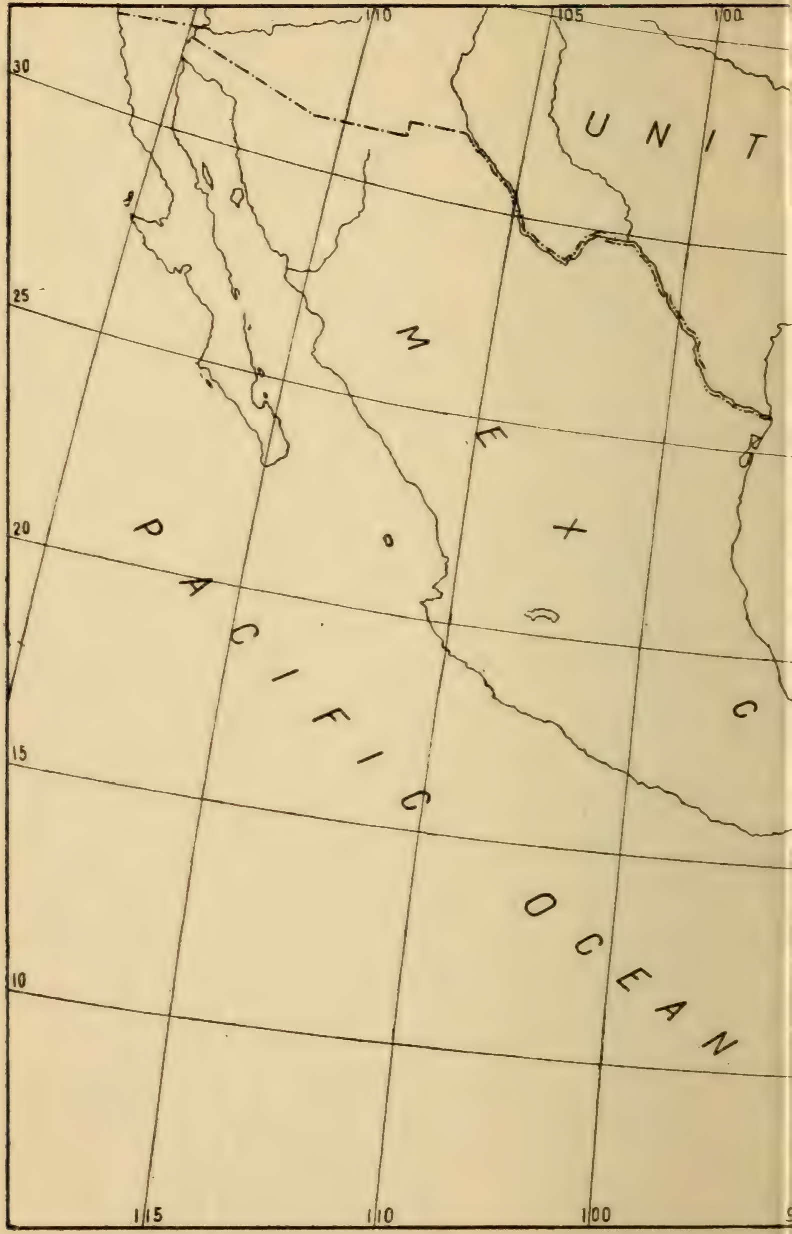
Mexico and Guatemala...................... 129
West Indies............................... 133

EAST HALL—ETHNOLOGY OF MIDDLE AMERICA AND SOUTH AMERICA

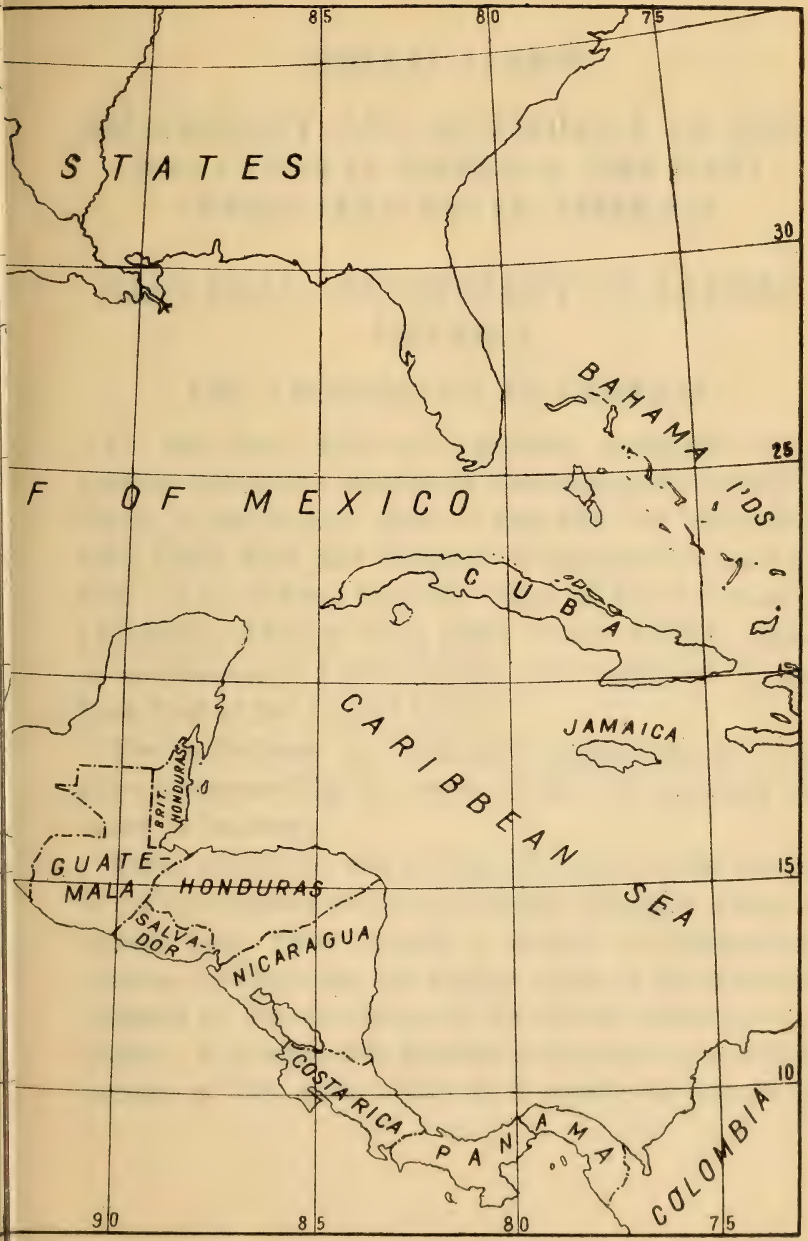
Costa Rica and Panama.......................... 135
Ecuador.. 146
Venezuela.. 161
British Guiana................................... 164
Dutch Guiana..................................... 172
French Guiana.................................... 173
Brazil... 173
Paraguay... 175
Peru... 179
Bolivia.. 181
Patagonia.. 183
Tierra del Fuego................................. 187

MAPS AND PLAN

Plan of Third Floor.............................. 1
Map of Mexico and Central America................ 9
Map of the West Indies........................... 59
Map of South America............................. 87
Distribution of Aboriginal Cultures in the West Indies (about 1492)......................... 134



MAP OF MEXICO



NTRAL AMERICA

THIRD FLOOR

ARCHEOLOGY AND ETHNOLOGY OF MEXICO, CENTRAL AMERICA, THE WEST INDIES, AND SOUTH AMERICA

WEST HALL—ARCHEOLOGY OF MIDDLE AMERICA

THE ARCHEOLOGY IN GENERAL

In the West Hall are exhibited antiquities from Mexico, Guatemala, Honduras, Salvador, and Nicaragua. Owing to inadequate space in this hall, the antiquities from Costa Rica and Panama are displayed in the East Hall. The objects from the ruins of Casas Grandes, Chihuahua, Mexico, being allied to the Pueblo culture of southwestern United States, are exhibited in the East Hall of the Second Floor.

The collections are arranged geographically, but objects representing the same culture will generally be found in sequence.

Aim of the collections

These collections aim to illustrate some of the phases of the pre-Spanish cultures of Middle America, where in former times there existed a number of independent cultures representing the highest stage of development attained by the aborigines of the North American continent. It is manifestly impossible to present a complete picture of the ancient life of a people by means of archeological objects brought together in a museum. Certain phases only may be presented. This is especially true of ancient Mexico, for the elaborate costumes and paraphernalia worn by nobility and priests in religious festivals and dances, described in detail by early writers, have disappeared, with the exception of fewer than a score of examples now in European museums. It is further obvious that architecture, and large stone sculptures such as monoliths and tablets, must be studied *in situ* or by means of casts and the various illustrated publications treating of the great ruined cities of the region. Certain other features of Middle American culture, as, for example, the priceless gold jewels and feather mosaic-work, are absent from the collection. The many uses made of native paper, with the exception of examples of the old records known as codices, will not be found illustrated in museums. Nearly all the codices on native paper are preserved in European museums and libraries, but the majority of them have been reproduced in facsimile and thus made available to students. We must content ourselves, therefore, with finding in museum collections only the more common and less perishable materials, such as vessels, figurines, and other minor objects of earthenware; small stone sculptures; and objects of bone, shell, copper, etc., in the forms of implements and idols.

Disappearance of early objects

A word may be said in regard to the origin and rise of the high cultures of Middle America, for they have an important bearing on the question of the development of aboriginal man in America. In the light of present knowledge it is clearly evident that while the various Middle American stocks, like all the American race, had a most remote Asiatic origin, they progressed toward civilization entirely free from contact with, or influence exerted by, any of the peoples of eastern Asia. The separation came before either people had advanced from the nomadic savage state. Had there been such later contact or influence, we would doubtless find in this region, where the natives reached their highest degree of culture, certain inventions commonly used from time immemorial in China, Korea, and Japan, such as wheeled vehicles, the plow, the carrying stick, terracotta roof-tiles, the potter's wheel, and chopsticks, as well as stringed musical instruments (with the possible exception of the musical bow), all of which are strangely missing. We may account in a measure for the absence of wheeled vehicles and the plow by the fact that draft animals, which have so profoundly benefited man in other parts of the world in his strides toward civilization, were unknown in the New World, if we except the dog and the llama. It may also be added that glazed pottery, glass, and the use of iron were not inventions to be credited to the ancient peoples of Middle America.

Origins

The first important remains of the ancient Mexican culture are found in the middle of that part of Mexico which lies north of the Isthmus of Tehuantepec, in the immense structures of La Quemada in the State of Zacatecas. They have been little studied, but probably are the remains of an ancient Nahuan settlement. In Michoacan the ruins of Tzintzuntzan bear some re-

Nahuan remains

semblance to those of La Quemada. This Tarascan region has been explored only to a limited extent, but the antiquities seem to be related stylistically to those of the earliest period of the Valley of Mexico. The great ruins of the Nahuan area include Tula, Teotihuacan, Xochicalco, Tepoztlan, Cholula, and Tenochtitlan (the site of the City of Mexico), the ancient capital of the Aztec, the dominant branch of the Nahua at the time of the Spanish conquest. Buried beneath the soil of the capital city lie vast numbers of objects, and also the bases of temples and other structures; but the imposing buildings, and most of the sculptures, idols, and books of the Aztec priests, were destroyed by the Spanish conquerors.

In the State of Guerrero, on the Pacific coast, are numberless ancient ruins, from which many interesting objects have been recovered, undoubtedly relics of Nahuan people. In this region, there is reason to believe, originated much of the jade found carved in many forms and designs.

In the State of Oaxaca, Monte Alban, the ancient Zapotec capital, is one of the most extensive ruins in Mexico. The ruined Mitla, in the same district, seems to have had little in common with the Zapotec structures, and must be attributed to the Nahua. In the mountains of the Mixteca, in the same state, the Mixteca, linguistically allied to the Zapotec, had developed a remarkable culture, as evidenced by the pottery, stone, and metal objects found in large numbers throughout the territory; but structural remains have been almost wholly destroyed.

Maya remains

Coming now to the region east of the Isthmus of Tehuantepec, which must be considered geographically as the beginning of Central America, we find buried in the forests of the Mexican states of Chiapas, Tabasco, Campeche, and Yucatan, the remains of hundreds of cities built by the Maya, the people who had made the greatest advance toward civilization of any of the aboriginal peoples of either North America or South America. Their most important ruins are Palenque, Piedras Negras, Seibal, Yaxchilan, Naranjo, Tikal, Labna, Kabah, Uxmal, Chichen Itza, Quirigua, and Copan. Some of these cities are in northern Guatemala, while Quirigua and Copan are considerably to the south, the latter (the southernmost of known Mayan cities) being in northern Honduras.

Architecture

In the fine arts the people of Middle America exhibited surprising development along certain lines. In architecture, the monumental remains of the Mayan area, the roofless Mitla temples in Oaxaca, the temples of Xochicalco and Papantla, and the recently uncovered Toltec structures at Teotihuacan, are visible evidences of the outstanding achievements of the Middle American Indians in this direction. Outside of the Maya area the ruins of hundreds of buildings may still be examined, but these edifices of the ancient Middle Americans are largely shapeless masses, found on excavation to have only the lower walls intact. The buildings in the Mayan area are characterized by massive walls of masonry faced with cut stones and covered with thin plaster, and having low doorways and triangularly-arched roofs.

In certain cases these are specialized constructions, due to the character of the stones employed. Some of the buildings exhibit successive periods of erection, and this is true of the remains of many edifices beyond the Mayan area. There are others which stand prominently as units of designs, such as the "House of the Governor" at Uxmal, 324 feet in length and containing 24 chambers. The palace at Labna contained more than 50 rooms and shows four periods of construction. The Mitla temples are gems of ancient American architecture, exhibiting a degree of perfection not seen elsewhere. Their method of construction is similar to that of the Maya, except that flat roofs instead of the triangular arch were introduced. The great pyramids of Teotihuacan, Cholula, Papantla, Izamal, Uxmal, Chichen Itza, Tikal, and others, are the best examples of this phase of culture; they were all designed to support temples. The many existing temples of Yucatan and Chiapas, and the splendid group at Mitla, are proofs of the mathematical exactness and ability of their ancient architects. Some of the burial chambers, such as the subterranean cruciform tombs at Mitla and the ossuaries of the Oaxaca valley, are elaborate and beautiful structures.

Size of the temples

Pyramids

In the use of stucco these ancients were exceedingly skilful, especially at Palenque, in the Mayan area, where magnificent painted bas-reliefs still remain on the temple walls, as well as at Labna, Acanceh, and Uxmal. Many of the pyramids were faced with stucco, as seen at Cempoalla and in the temple pyramid at Tepoztlan, whose white cement surfaces still exemplify this form of

Stucco ornament

embellishment. The pyramids of Cholula and some of the Teotihuacan structures also belong to this class; but the pyramids of Xochicalco, Papantla, Chichen Itza, Uxmal, and Tikal, were faced with stones. The temples on the summits of these pyramids, some of which rise to a height of more than 200 feet, were reached by broad, steep stairways of stone, some of them inclining at an angle of about sixty degrees. Great ball-courts were also erected.

Sculptures

Sculptures in stone are found everywhere, ranging in size from small amulets representing deities to such colossal pieces as the famous Aztec calendar stone, now in the National Museum in Mexico, and the great stelæ of the ruins of Quirigua, Guatemala, where one of the monoliths is 35 feet in height.

Carvings

Carving in stone, bone, shell, and wood was done with tools of stone, copper, bone, and hardened wood, with the aid of sand and water. Emeralds, jadeite, turquois, chalcedony, opal, rock crystal, obsidian, onyx, and serpentine were carved into numberless varieties of personal ornaments, chiefly in the territory of the Nahua and the Mixtec-Zapotec of Oaxaca, and by the Maya in the mountainous parts of Chiapas and in Guatemala, wherever the desired materials were obtainable. Pearls, mother-of-pearl, and bright-colored shells were used with the precious stones in fashioning necklaces, bracelets, ear-ornaments, and other articles of adornment for the nobles, as well as for idols.

Jewels

One of the most interesting and highly developed arts in prehistoric America was that of incrusting objects for

Mosaic

ceremonial purposes with precious and semi-precious stones. This form of art reached its highest development among the Nahua, and was practised by the Mixtec-Zapotec and Tarascans. Excellent examples are known also from the Pueblo region in Arizona and New Mexico; but these, together with turquois mosaic objects from Peru, indicate a somewhat similar though far less perfected application of the art. The materials usually employed were turquois, jadeite, malachite, quartz, beryl, garnet, obsidian, pyrites, gold, and varicolored shells, fastened to a base of wood, bone, stone, pottery, shell, gold, or paper, by means of a tenacious vegetal pitch or gum, or a kind of cement. The best preserved of these objects are very beautiful, and indeed represent such a high type of art that they must be classed among the rarest specimens of American archeology, less than fifty examples being known. The shields and masks in the West Hall were found in a cave in the Mixteca region of the State of Puebla, Mexico, and probably had been preserved by the natives for many generations after the conquest, revered as precious relics of a lost but not forgotten culture.

Shields and Masks

In metallurgy the ancient Tarascans, the Nahuans, Mixtec-Zapotec, and the Totonac, were very skilful in the manipulation of copper into axes, tweezers, finger-rings, rattles, and bells. Some of the objects have proved on analysis to be true bronze. Beautiful objects of gold have been found in the Matlaltzincan region in the Toluca valley, and in the Mixtecan-Zapotecan areas, representing the very highest achievement of the

Metallurgy

ancient American goldsmiths. Ear, nose, and lip ornaments; beautiful bells, some representing symbolic faces and heads of animals; beads; circular breast-plates; forehead bands and crowns; bracelets and anklets, and even the remains of armor, all fashioned from the precious metal, have been found in ancient graves. Unfortunately most of such objects were long ago consigned to the melting-pot. Gold was used also to enframe gem stones carved in various forms, and to adorn shields and fans. A book on the subject of the "Goldsmith's Art in Ancient Mexico" has been published by the Museum.

Feather mosaic

Another art practised by the Nahuan and Tarascan peoples was a class of mosaics in which the designs were made up of tiny bits of colored feathers instead of stones. This unique art was employed in adorning objects for personal use, for warfare, or for priestly ceremonies. The designs were produced by cementing the tiny bits of feathers either directly on wood or on wooden objects covered with skin or with native paper. From descriptions of feather mosaics by the early chroniclers, and from a study of the few specimens that have escaped the ravages of time, it is evident that this art attained the highest artistic level reached by any of the aboriginal tribes of America. Such great care was taken to produce a perfect piece of work that objects of this class were often mistaken by the Spaniards for paintings.

Wood-carving

In woodcarving the Mexican and Mayan tribes displayed even more skill than in the working of stone.

The great altar tablet of Tikal, the wooden drums, and the atlatls, or spear-throwers, splendidly carved with mythological designs and in some instances covered with gold-leaf, attest their proficiency in this branch of the fine arts.

Pottery

The ceramics are quite distinctive among the several advanced peoples, hence the provenience of their pottery objects is determinable with more or less exactness. The terracotta figures of the Nayarit-Jalisco-Michoacan district, the earthenware from the vicinity of Cholula and from various sections of the Valley of Mexico, the funerary urns from the Oaxaca valley, and the pottery from different Mayan centers, are characteristic of each culture area. However, as pointed out in a recent study of Mexican archeology, there is pressing need of an accurate classification of Middle American pottery and of a careful investigation of the various qualities of clay employed in the several districts. The latter is particularly important, since it would afford more conclusive evidence regarding centers of pottery manufacture than a mere study of forms. Community of form really only implies connection, and often merely trade connection, which may be second, third, or even fourth hand; but careful investigation of the materials will often reveal the actual locality of manufacture, and when this is fixed for a number of centers, the main lines of trade and the esthetic influence exerted by one locality upon another may be estimated with more than a fair degree of accuracy.

Painting

Painting was another art which flourished in this part of the New World, as shown by the mural decorations on cement at Teotihuacan, Mitla, and Chichen Itza, and those recently discovered at Tuluum, on the eastern coast of Yucatan, and at Santa Rita in British Honduras. The art of painting was considerably developed also in the decoration of pottery, the colors being sometimes applied to a slip of stucco, but in most of the polychrome ware they were applied directly to the clay. This type of ware is found in so many culture areas that the extent of its production is manifest.

Personal adornment

Among the customs of these civilized tribes were tattooing of the skin, and decoration of the teeth by filing and inlaying with such materials as jadeite, turquois, hematite, obsidian, rock crystal, and a kind of cement. Labrets of obsidian, rock crystal, and a combination of rock crystal and gold, were worn. Small horseshoe-shape ornaments of obsidian, stone, or shell, were suspended from the nasal septum, and ornaments of various kinds of stone and of other materials, often of wheel-shape, with a flange, were inserted in perforations in the lobes of the ears. Artificial head-flattening and trephining were also practised.

Musical instruments

Many of the musical instruments are still extant. In various museums are found examples of the *teponaztli*, the horizontal drum made from a log of wood, hollowed on the under part, and having two tongues cut out on the upper surface, which were beaten with two rubber-tipped sticks. The upright drum, called *huehuetl*, made from a hollowed log with a head of skin, was beaten with the hands. These drums were generally elaborately carved with mythological designs, and the *teponaztli* often was fashioned into the form of a human being or an animal. Flageolets, whistles, and rattles of clay, and trumpets and rattles of shell, are of common occurrence. Bones from the human arm or leg were notched and rasped with a bone, or a shell, or a wooden baton, to mark time in native dances. It is almost certain that the musical bow was used by the ancient Mexicans, and it still survives among the Maya of Yucatan. This was the only stringed musical instrument known in ancient America.

Songs

Judged by our standards the ancient Mexicans were not a musical people; yet no public ceremony was complete without songs and instrumental accompaniments; they were indispensable in the religious services held in the temples, for by their aid the sacred and historical traditions were preserved. Early writers unite in praising the perfect unison observed by the singers in their performances. Each temple had a band of trained singers, who chanted the songs in monotonous tones, accompanied by the native instruments. The songs were of many kinds, some chanting the praises of the gods or invoking their favors, others recounting the history of former generations; still others were didactic and inculcated correct habits of life, while there were songs in lighter vein that treated of hunting, games, and love. Many of the sacred songs and hymns that have been preserved reveal a highly poetic gift of expression, and their sentiments are of an infinitely higher character than the quality of the music to which they were set.

The ancient peoples of Middle America had developed a certain commercial system of trade and barter, the

Commerce

main features of which were: markets in one or more of the public squares of every town where food and other supplies of immediate necessity were daily sold, ordinary shops being unknown; frequently recurring fairs in each of the larger towns where the products of agriculture, manufacture, and the arts from the surrounding country were displayed before customers and merchants from home and abroad; and similar fairs, but on a grander scale, in the great commercial center, where home products were exchanged for foreign merchandise, or were sold to merchants from distant regions, who attended in large number. Itinerant traders continually traversed the country in companies or caravans. The merchants of the Valley of Mexico formed a highly important and greatly honored class. Owing to this system there are found in ancient graves artifacts from far-distant areas and pertaining to other cultures.

Codices

One of the most important sources of information for the study of the ancient culture of this part of the continent is found in the existing pictorial and hieroglyphic codices. As is well known, several of the tribes of Middle America had reached a stage of culture at the time of the Spanish conquest that found expression in the recording of certain events and of mythological and astronomical matters, not only on stone bas-reliefs and in other forms of sculpture, but on material of a more perishable nature. They made books, generally called codices, of strips of well-tanned deerskin, which were folded screen-fashion and covered on both sides with a stucco sizing, on which the paintings were applied. They furthermore had invented a kind of paper, made from various materials, such as the membrane under the bark of a certain tree, and fiber from leaves of the amate tree and of the maguey plant. This paper was also sized with a coating of stucco. One of the things which impressed Cortés, when he came in contact with the messengers of Montezuma sent out to receive him, was that some of them were busily employed in making paintings of the Spaniards—their costumes, arms, ships, and other objects of interest, giving to each its appropriate color. These were to convey to Montezuma, in picture-writing, an idea of the appearance of the conquerors, and are the first notices we have of the existence of this art in ancient America. In symbolic and picture writing the Maya were approaching a phonetic system. Recent progress has been made in an interpretation of the codices of the Nahuan and Mixtecan groups, as well as signal success in the decipherment of the hieroglyphic writings of the Maya, preserved in codices, and on tablets, stelæ, and pottery. Of the Mayan type of inscriptions, certain dates and methods of computation have been determined, and in some instances nearly half of the inscriptions have been successfully deciphered. A correlation of initial dates on many of the stone monuments has been made with a high degree of certainty with the years of the Christian era, so that it is now possible to determine with accuracy the period of occupancy of many of the old Mayan cities. To the two known systems of pictographic and hieroglyphic inscriptions, recent investigations in Oaxaca have added a third form among the Zapotec.

Hieroglyphs

The complex calendar system of the Tarasco, Nahua, Mixtec, Zapotec, and Maya, is fundamentally the same, and is evidence of the remarkably high culture which they had attained. But the Maya had a more extended method than the Aztec for the computation of time; in fact, the Mayan calendar is the highest intellectual achievement of the American Indians. Recent investigation of this calendar has revealed various time periods, elaborate computations, and a knowledge of the movements of certain planets. It is now possible to state that, in a number of old Mayan cities the stelæ were erected at intervals of five years. The general scheme of the calendar proper was the division of the year into two unequal parts, 360 days being the year, divided into 18 months of 20 days each; at the end of the last month 5 nameless days were added to complete the true solar year. Each of the 20-day periods had its own name and symbol, but the days were numbered from 1 to 13 instead of from 1 to 20. By this method of numeration the day bearing the same name and number did not recur until the 13 periods had elapsed, making a period of 260 days, called by the Aztecs *tonalamatl*. It was a year within a year, and was used for divinatory or religious purposes. There were also many other intricacies in the Mexican calendar, some of which have not yet been explained.

Calendar systems

The ancient Mexicans believed in a future life, which was graded according to the manner of death, and among the Zapotec there were elaborate mortuary ceremonies and the sacrifice of slaves to assist the shades of important persons on their journey to paradise. They had

Religious beliefs

greater and lesser deities. The principal Aztec god was Teotl, who was worshiped as a supreme being; next was Tezcatlipoca, venerated as the soul of the world, who rewarded the righteous and punished the wicked. The great beneficent god was Quetzalcoatl among the Nahua, called Kukulcan by the Maya, represented by the great feathered serpent deity, undoubtedly a deified culture hero. He invented the arts and by his laws taught the people wisdom. According to his various attributes he appeared under different guises and names, as do other gods of the Mexican pantheon. Tlaloc was the god of rain; and among the Aztec, Huitzilopochtli, the terrible war god, was their patron and protector. There were gods of the hunt and the chase, of play, flowers, wine, merchants, trickery, lust, and so forth, while each trade and occupation had its own patron deity. The religious rites were elaborate and were prescribed with minuteness. The multiplicity of gods required a great number of priests and priestesses, who were almost as highly venerated as the deities they served. There were degrees of priesthood and religious orders. Fixed and movable festivals were common. The great *teocallis*, or god houses, were commanding edifices of stone or adobe, built on high truncated pyramids with annexed buildings. The idols were many and hideous, often smeared with blood from human and animal sacrifices.

Frauds In studying Middle American artifacts the student is confronted by the great number of clever frauds which have found their way into all museums and private collections.

ANCIENT MEXICO

Six different cultures are represented in the collections from ancient Mexico exhibited in the Museum, namely:

1. North Mexican
2. Tarascan
3. Nahuan or Mexican
4. Mixtecan-Zapotecan
5. Totonacan
6. Huaxtecan-Mayan

North Mexican Culture

(Case 313 A)

In this area (except the artifacts from Casas Grandes exhibited on the Second Floor) are included specimens, largely of stone, from the states of Sonora and Sinaloa, and from Lower California. Nothing has been discovered in this region to indicate any such degree of culture as that attained farther south.

Tarascan Culture

(Case 313 A B)

Under this general heading may be included the antiquities of the states of Nayarit, Colima, Jalisco, and Michoacan. It is certain that in this extensive region are the remains of more than one culture, but the archeology is yet too little known to admit of subdivision. It is apparent that many of the small human figures of earthenware exhibited closely resemble those of what is known as the Archaic or Sub-Pedregal culture epoch of the Valley of Mexico. Generally speaking, the material is characteristic of the region in which found, and cannot be confounded with objects from other culture areas to the north and south.

Range of culture

The Tarascans appear to have been the people who attained the highest degree of culture in this section of Mexico, and their language is still spoken in a restricted part of Michoacan, where formerly nearly the entire area was controlled by this tribe, as shown by geographic place-names. A few now live in the adjacent states of Guerrero, Jalisco, and Guanajuato. The Tarascans were a valiant people, and for the greater part remained free from Aztec domination at the opening of the sixteenth century, the period immediately preceding the advent of the Spaniards. They do not seem to have been so proficient in architecture or in stone-carving as their neighbors to the south. Remains of their material culture, so far as known, are confined largely to ceramic objects, such as receptacles, and human and animal figures, and to objects of metal, stone, and shell. They are reputed to have been skilful in weaving and in the production of feather mosaics.

Pottery 313 A B

As in the case of other peoples of Middle America, many phases of the Tarascan culture are lost, but a certain knowledge of their customs and costumes may be obtained by a study of the considerable numbers of large human figures of earthenware found in a great variety of forms in graves and in subterranean vaults throughout the area once occupied by them. These figures are of particular interest as showing the styles of dress, the nose and ear ornaments, the customs of tattooing, head-flattening, and hairdressing, and their weapons, implements, and musical instruments. These pottery objects form a class distinctive of the area in the character of the reddish or brownish terracotta of which they are made. Animal figures are also found.

Negative painting

A method of decorating pottery vessels and figures found in widely separated areas of ancient America was in vogue among the Tarascans. This is called negative painting, and was achieved by placing on the vessel or figure the pattern in wax or in other soluble or combustible material, over which a permanent paint was spread. After firing or immersing in boiling water, the design appeared in the color of the clay outlined by a black or red paint. This method of decoration still exists in Middle America, but is restricted to gourd vessels.

Encaustic ware

The most important phase of the ceramic art of this area was the production of a type of decoration on vessels commonly called encaustic, or cloisonné. After firing, the vessel was covered with a rather thick coating of a kind of bluish-gray clay or a blackish or greenish pigment, into which were cut designs representing geometric or human figures. The sunken spaces were then filled with pigments of varying colors, producing a kind of mosaic decoration. The exact counterpart of this style of ornamentation is not known elsewhere, but pottery vessels from the Nahuan region showing somewhat analogous treatment will be noted later. The encaustic process still persists among the Tarascans in the embellishment of gourd and wooden plaques—the so-called lacquer-ware made near Uruapam.

Smoking-pipes of pottery also have been found in this region, of a type different from those of the Valley of Mexico, the only other part of Middle America where they have been encountered in relative abundance. Pipes 310

The Tarascans were proficient in the goldsmith's art, beautiful bells and discs being found in graves, and they succeeded in beating gold-leaf which they applied to beads and to vessels of pottery. Some of the objects of copper fashioned in filigree are among the most skilful art products in this metal to be found in ancient America. Metalwork

In the region of the Tarascans is found the only survival in Middle America of the *atlatl*, or spear-thrower, a grooved stick used to propel a spear, employed by the Indians in catching fish in the lakes. Atlatls 315B

NAHUAN OR MEXICAN CULTURE

(Cases 310, 312, 313 C D, 314, 315, 320)

The numerous and powerful family of which the Aztec are the best known branch, extended over a considerable part of Mexico from the State of Sinaloa along the Pacific coast in the northwest, down through the western part of central Mexico, reaching the Atlantic coast in the State of Vera Cruz, and crossing the Isthmus of Tehuantepec into the State of Chiapas. Colonies settled also along the Pacific coast of Central America, notably in Guatemala, Salvador, Nicaragua, and Costa Rica, and even along the Atlantic coast of northern Panama, and they even extended their sphere of influence into the Maya region along the Gulf of Mexico in Range

Tabasco and Yucatan. Linguistically the Aztec or Nahua are allied to the Shoshonean and Piman tribes of western and southwestern United States and northwestern Mexico, forming a vast stock which numerically is the largest and ethnologically the most important in North America. There are today probably two million Indians in Mexico speaking the Nahuan or Mexican language. In the great area formerly occupied by this people, all kinds of environment are to be found, from the humid lowlands of the torrid zone, the fertile lands of the temperate region of the mountains, the windswept almost desert plains of the great interior plateaus, to the cold country of the forested highlands. This family reached the highest degree of culture in North America proper, considering that part of the present Republic of Mexico east of the Isthmus of Tehuantepec to belong geographically to Central America. Its development from a state of nomadic savagery to the relatively high culture observed by the Spaniards at the beginning of the sixteenth century must have required a long period of time. Tribe succeeded tribe in waves of migration in different parts of the country, and ruined cities are scattered throughout the region.

Sequence of Archeological Periods in the Valley of Mexico

Recent archeological investigations in the Valley of Mexico have brought to light three well-defined types of ancient culture. In a number of sites these cultures have been discovered superimposed, the earliest being in some instances 15 feet below the present surface. The objects thus far recognized as being of this earlier epoch are mainly of pottery—small complete figures and heads in human form, and sherds of vessels. The style of modeling the figures and heads closely resembles that of the Tarascan area.

There has also been found a transitional type between that of the earlier and the middle periods.

The types of cultures have been denominated as—

Archaic or Sub-Pedregal Type
Transitional Type
Teotihuacan or Toltecan Type
Aztecan Type

In addition to the more or less stratified remains beneath the débris of ruined cities, objects of the Archaic type only have been discovered under a thick and extensive lava-flow known as the Pedregal, a discovery that definitely establishes the character of the art of the Archaic period, as the remains are identical with those found in the lowest stratum at other sites.

The term Teotihuacan (formerly generally called Toltecan) has been given to the type of artifacts of the next chronological period, because of the knowledge gained from a study of the great mass of material found at the imposing ruined city bearing that name near the present City of Mexico. Here also Archaic remains, as well as numerous specimens of the Aztecan type, are found, verifying what is known historically regarding the late Aztec occupancy of this site.

The Aztecan type has been established by the character of the material found beneath the City of Mexico, the site of the former Aztec capital, and on or near the surface in the immediate vicinity.

A collection from the environs of the City of Mexico and from the ruins of Teotihuacan is displayed (Case 312), arranged, according to the types established, under the direction of Dr. Manuel Gamio.

Nahuan pottery 310, 313, 314, 320,

The ceramic art of the Nahuans is fairly well represented in the collections of the Museum. Painted ware predominates in the bowls, plates, ollas, and censers, found abundantly in the great central plateau region. Local differences in style of decoration may be noted in the various groups. Of minor objects small human figures and heads, used in religious rites, have been found in great numbers. Artistically engraved spindle-whorls are common. Personal ornaments were often made of pottery.

Objects of semi-precious stones 315

Other objects

In personal ornaments and other objects and implements of various kinds of semi-precious stones, may be gained an idea of the skill of the old Mexican lapidaries. Some of the very small pieces are veritable gems of carving. The varied uses of obsidian, or volcanic glass, are well displayed by the exhibit, and the employment of shell and bone in implements and ornaments is also shown. The curious use of human leg-bones for musical instruments will be noted.

Stone masks, idols, boxes 315 A B

An interesting series of stone masks and idols are examples of stone-carving of considerable merit. The Nahuans made stone boxes with covers elaborately carved with mythological designs and dates, these used for containing the ear-blood offerings to the god Tezcatlipoca. A splendid specimen representing the sun disc,

Sun-stone 315 A

over which is carved a human figure with the head thrown back as if in supplication or worship, is likewise exhibited, and has been described in a Museum publication. Like the boxes, it belongs to the Aztecan period.

Mosaic shields and masks 315 C D

The Museum is fortunate in possessing, through the characteristic interest of Mr. James B. Ford, a remarkable series of the turquois mosaic-work of the Nahuans. These ceremonial shields and masks of wood incrusted with mosaic-work were found some years ago in a cave in the mountain region of the Mixteca in the State of Puebla. Recently illustrated and described in a Museum publication, they are the only collection of the kind in any American museum, and the largest series in existence, seventeen specimens being displayed.

Atlatls 315 B D

From the same region are the two beautiful ceremonial atlatls, or spear-throwers, carved with mythological designs, one of which bears the date 1489 in Aztecan hieroglyphs. They are among the rarest of objects from Middle America. Above is exhibited another type of spear-thrower, a modern survival used by the Tarascan Indians of Lake Chapala to launch spears in taking fish.

Native paper 315 D

Certain fragments of paper used for wrapping gum incense for ceremonial offerings are shown.

Mixtecan-Zapotecan Culture

(Cases 309 A B, 311)

The Mixtecan-Zapotecan people occupied the region of southern Mexico called Guaxaca in pre-Spanish times,

Culture status

now known as Oaxaca. In the beautiful fertile valleys and in the mountains, the people of this stock reached a high degree of culture, and although their antiquities reveal both Nahuan and Mayan influences, in the main the culture retained its individuality. Few cities remain to enlighten us concerning their architectural attainments. Their sculptures in stone, such as small slabs, stones to seal underground tombs, lintels of tombs, and stelæ, are peculiarly local in type. The great capital city of the Zapotec in the valley of Oaxaca, now called Monte Alban, undoubtedly the ancient Zachila, is one of the most extensive and imposing ruins in the New World, occupying the summits of several hills commanding three valleys. The wonderful ruins of Mitla include a number of beautiful and well-preserved structures, apparently temples, the most remarkable examples of aboriginal American architecture, but indicating strong Nahuan influence in the region. In the valleys of the central area are numerous groups of mounds dominated by a large pyramid or temple mound. Explorations have shown that the majority of these were designed for mortuary purposes, as they cover sealed stone vaults—ossuaries where the dead were deposited with various personal ornaments, food vessels, and other objects. After elaborate ceremonies once a year for four years, the defleshed bones were often painted red and placed either on the floor or in niches in the walls of the vault. The doorway was then sealed with a large stone, often sculptured with mythological figures, and large funerary urns, often in series of five, were placed near the chamber to guide the spirits of the deceased on their journey

Monte Alban

Mitla

Mortuary mounds

to the afterworld. Terracotta tubing, sometimes elaborately decorated, or stone drains, often led from the front of the tomb outward, probably to prevent water from entering the chamber while the tomb was left uncovered, although it has been suggested that perhaps they may have served as an outlet for the escape of the souls of the departed. Afterward the vault was covered with earth, adobe bricks, and stones, and sometimes over the mound a dome-like covering of white cement was erected. The innumerable antiquities from the Zapotecan region have been found largely in tombs of this description.

Funerary urns 309 B

Among the most interesting specimens of ceramic art in Mexico are the funerary urns from these ancient tombs. They represent gods, men, and animals, and are interesting by reason of the personal ornaments which they bear, modeled in clay, including various forms of ear-ornaments, necklaces of stone and shell, beads, breast-ornaments in the form of human heads, and hieroglyphs. Where no mask covers the face, the teeth in many instances are filed, a custom which prevailed extensively in Mexico and Central America. Garments shown are capes, skirts, and loin-cloths.

Personal ornaments

Objects of semi-precious stones 311

In the working of semi-precious stones and obsidian into personal ornaments and amulets, the people of this region were especially skilful. The many jadeite ornaments and implements are noteworthy for their beauty. The most striking specimens of carving in this material from the region of Mexico west of the Isthmus of Tehuantepec are from the State of Oaxaca. The little stone amulets, usually representing rudely carved human figures, were probably worn as the central feature of a string of stone beads, in much the same manner as the Indians of today wear a crucifix. Small carvings in shell and bone from the Mixteca and the valley of Oaxaca, studied in connection with the ornaments and carvings in stone, reveal high artistic skill not exceeded in any other part of ancient America. An object of especial importance is the roughly blocked-out vessel of onyx representing a death's head. It was in process of manufacture and shows the method of excavating the interior by means of a hollow drill and breaking off the resultant cores. The Mixtec and Zapotec were the most proficient goldworkers of Middle America, some of their ornaments found in tombs being masterpieces of the goldsmith's art. These Indians also employed copper and bronze in fashioning ornaments and implements. All in all, the art remains of these people show them to have been in many respects the most esthetically advanced tribes of America.

Other ornaments

Onyx vessel

Metalwork

TOTONACAN CULTURE

(**Case 308 A B**)

In the central part of the State of Vera Cruz are found the remains of the Totonacan culture. Its affiliation with the Nahuan or the Mayan people has not been definitely determined, but the art of the region shows certain decided influences from both sides. Such meager investigation has been conducted in this important area that we are ignorant of many phases of what seems to have been a very high development of the aboriginal culture of ancient Mexico. In this region are the ruins of well-built cities containing interesting pyramidal structures (*teocallis*), one of which, Papantla, is among the most imposing of its kind in Middle America. At the time of the visit of Cortés, the glistening white walls of the edifices of Cempoalla, the capital city, made a profound impression on the Spaniards.

Papantla

Cempoalla

In ceramic art the Totonac were unsurpassed in the modeling of expressive human heads and figures, notably the so-called "laughing faces" which are confined to a single restricted area. Another peculiarly local feature of their art is the common use of a black bituminous paint to represent the mouth and eyes of human heads of pottery of the archaic type, a feature rarely encountered in other parts of Middle America. Polychrome ware was highly developed.

Pottery
308 B

The well-known stone "collars," or "yokes," of Mexico apparently emanated from this territory, and many conjectures have been advanced regarding their use. They have been supposed to have been placed over the necks of victims to be sacrificed in religious ceremonies; but there is reason for belief that this type of objects represents an idol, probably an earth god, as the U-form of the sculpture is the same as that employed in picture-writings to represent cultivated ground. In this sense it may have been intended to symbolize the God of the Underworld, or of Death. The other type of carving is palmate or paddle-shape, and it

Stone collars
308 B

seems to be somewhat closely associated with the yokes. There is great variation in size and details of sculpture in the palmate type; but both classes are among the most beautifully wrought objects of stone known to Middle America. A few specimens have been found far from their place of origin, undoubtedly transported during pilgrimages to the shrines of some great deity.

Palmate carvings

HUAXTECAN-MAYAN CULTURE

(Cases 300–308)

In the great area covered by the Mayan culture the American Indians reached their intellectual climax. The Mayans were the only people of the New World who had invented and perfected a complicated hieroglyphic system approaching phoneticism, for recording time periods, dates, and mathematical calculations; indeed they were mathematicians of a high order. Their dates are capable of correlation, with a fair degree of accuracy, with our own chronology to periods before the beginning of the Christian era. These records, expressed in pictures and hieroglyphs, were carved on stone, wood, or terracotta, and use was made of screen-like books, called codices, of a kind of bark paper coated with a thin lamina of stucco, the subject-matter of which was graphically painted in various colors. Only three of these codices survive, but it is probable that many were buried in tombs of ancient priests and will be recovered when more extended archeological work is carried on in the Mayan territory.

Glyphic system

Age of the culture

The exact region in which the ancient Mayan culture had its inception is still unknown. The earliest date thus far found is recorded on a small idol of jadeite from a place outside the Mayan linguistic area, in the mountains of southern Vera Cruz, Mexico. From the character of its carving this relic probably points the way to the region where search should be made for the birthplace of the Mayan culture.

Its development

But the Mayan family developed its highest culture in a region of rich lowlands, where nature was lavish with her gifts and highly organized labor was necessary in order to control the luxuriant tropical vegetation. In this area are found nearly all the important ruined cities with stone buildings, which occupied the greater part of southern Mexico east of the Isthmus of Tehuantepec, now included in the states of Chiapas, Tabasco, Campeche, and Yucatan, and British Honduras on the eastern coast of the Yucatan peninsula. The Maya influence extended over Guatemala (with the possible exception of a narrow strip on the Pacific coast), southward into northern Honduras, and perhaps over the greater part of Salvador. Separated from this vast territory by Aztec-speaking peoples, in the northern part of the State of Vera Cruz, in the region of Tampico and Tuxpan, there are found even today a people known as Huaxtec, who speak practically pure Maya, but whose arts and customs, as well as antiquities, are remote from those of the Maya of Yucatan.

In the general area mentioned, the family was divided into seven branches speaking numerous dialects. Over

Range of the Mayans

the entire northern section, the State of Yucatan, pure Maya is still spoken by several hundred thousand people. In Guatemala the Mayans predominated, but along the Pacific coast are the remains of another and lower culture, the little-known Szinca, whose language is apparently related to one of those of the State of Oaxaca, and is considered to be that of a people who preceded the Mayans in this area. Another and later culture is that of the Pipil, a branch of the Nahuan, who undoubtedly came into the land at a comparatively recent period, and settled along the coastlands of Guatemala and Salvador. They have left in Guatemala interesting large stone sculptures of a distinctive character.

Szinca and Pipil

Seats of Mayan culture

The culture of the Mayans developed in the southern and southwestern sections of the country; later the first of their great cities was abandoned and the people worked their way northward into Yucatan. The earliest dates on the ancient stone monuments thus far discovered in the so-called ''old empire cities" extend to the second century of our era and reveal a full-fledged civilization, "the flower of long-continued astronomical observations expressed in a graphic system of exceeding complexity." It is probable that, as research progresses, dated monuments may be discovered that will carry back the records many centuries.

Buildings

In the magnificence and variety of their massive stone buildings the Mayans were unrivaled in ancient America. The architecture of the various districts depended largely on the physical and orographic nature of the land and the character of the local building materials. On the table-lands of Guatemala and Chiapas the existence of independent tribes living in close proximity rendered it necessary for the cities to be built more compactly, and in many cases they were fortified. Here architectural refinements are not found.

Cities

It seems clear that the greater number of the cities were centers of population surrounding the temples of worship and the residences of the rulers. These cities were not densely populated except at fixed times, such as during religious festivals or stated markets. Artisans, merchants, priests, those connected with the care of the temples, and the rulers and their followers, formed the permanent population of the towns, which were truly sacerdotal cities. Most of the people lived then, as now, in simple thatch-roofed huts surrounded by their cornfields, and were scattered widely over the country.

Temples and Palaces

The principal edifices were built on artificial terraces and grouped around courts. An ever-present feature is a large pyramid from which rises the temple. The permanent buildings, therefore, may be grouped roughly into two classes, namely, temples, and so-called palaces which were probably the habitations of the priests and rulers.

Pyramids and Towers

Many of the structures, such as small buildings on lofty pyramids, and certain circular towers found occasionally in various part of the Mayan area, were unquestionably used for astronomical purposes. The ornamentation of the stone buildings consists of sculptured façades, door pillars, and lintels, and often the interior walls are elaborately carved. Sometimes stucco was lavishly employed, and in many cases colors were used in decorating the stone or stucco-covered walls. Mythological and historical paintings in various tones have been discovered on the plastered walls of rooms, and in some edifices elaborately carved wooden lintels and altar tablets have been found. Massive carved slabs and other monoliths occur at many of the ancient sites, which from interpretation of their inscriptions seem to have been erected at intervals of five years.

Ornamentation of buildings

On the nature of the building-stone found in the district, native architecture and sculpture depended. As the available stone material was less fit for sculpture, the excellence of the ceramic art increased proportionately, as evidenced by the antiquities of the Alta Vera Paz highland region of Guatemala, where little good building-stone existed, hence substantial advance in architecture became arrested. The polychrome pottery and sculptured terracotta artifacts here, however, reflect an artistic skill that was not surpassed by any of the other Mayan tribes.

Pottery

Generally speaking, the Mayans were expert potters, employing a variety of technical processes in the decoration of their earthenware, such as painting, modeling, engraving, sculpture, and stamping. Some of the most beautiful examples of the ceramic art of ancient America have come from Mayan tombs. To the Mayan culture must also be attributed the so-called glazed ware, characterized by a surface luster forming a semi-vitreous glaze of varying shades, nearly always with a mottled surface. This ware probably had its origin among some tribe or family of potters of Guatemala, where was found the clay that possessed ingredients productive of this peculiar glaze. Specimens have been found at widely scattered sites from western central Mexico to Salvador, giving evidence of the extensive trade connections of the Mayans.

Unity of culture

In considering the Mayan culture one must examine collectively the artifacts from the entire area dominated by it. There is a general similarity in the archeological objects from eastern Guatemala and from adjacent lands to the north, in southern Mexico, in the states of Chiapas, Tabasco, Campeche, and Yucatan, and in British Honduras, as well as to the south in Honduras and Salvador. Local types of pottery and of other objects are found, due probably in large measure to differences in time in the development of the Mayan people. While sculptures bearing hieroglyphic inscriptions may be placed in their proper chronological position by an interpretation of their dates, as well as on stylistic grounds, the minor objects generally cannot yet be thus classified, as has been done with the pottery figures and sherds found in the Valley of Mexico.

YUCATAN PENINSULA

(Case 304)

STRICTLY speaking, the archeology of Yucatan includes the Mayan antiquities found in the Mexican states of Campeche and Yucatan, the territory of Quintana Roo, the Colony of British Honduras, and the Department of Peten in Guatemala, for these are all modern political subdivisions of the Yucatan peninsula.

Only a few specimens are exhibited from the State of Yucatan. The most important of these are the portrait heads of stucco from a subterranean chamber in the House of the Governor at Uxmal, the finest known examples of work in stucco from Middle America. The copper bells and mass of copal incense were recovered from the sacred cenote at Chichen Itza, part of the vast sacrificial offerings cast into the well with human victims.

Stucco heads 304

Bells Incense 304

Among the pottery vessels is a noteworthy example of a sculptured vase made of a beautiful highly polished paste, exemplifying a class of late Mayan ware peculiar to the Yucatan peninsula. Pottery whistles and rattles are excellently modeled, and are like those from the neighboring states of Campeche, Tabasco, and western Chiapas. These types, however, are rarely found in British Honduras. Beads of pottery are exceedingly common, in contradistinction to those of stone, which are comparatively rare, for there is no stone in the peninsula well adapted to the making of ornaments, especially the prized greenstone, like jadeite, which could have been transported only from the distant Chiapas mountains. This scarcity of stone accounts for the great abundance of personal ornaments of shell of varying shapes and sizes, nearly always found in the tombs of Yucatan. The first Spaniards who skirted the coast received from the Indians of Tabasco many necklaces of gold-covered earthenware beads.

Pottery 304

Ornaments 304, 305 A

From Chiapas will be seen two beautifully carved ornaments of jadeite, and a remarkable knife chipped from mahogany obsidian.

BRITISH HONDURAS

(Cases 305, 306)

Pottery 305 B 306 A B

THE most important collection of Mayan antiquities in the Museum is from British Honduras and the adjoining Department of Peten in Guatemala. Splendid examples of polychrome ware are exhibited, elaborately painted with mythological designs. One of the cylindrical jars bears the only hieroglyphic inscription known on a pottery vessel that can be interpreted and the date correlated with our chronology, namely, about 600 A.D. Attention is called to the carefully modeled and painted earthenware figurines and large incense-burners characteristic of this part of Mayan territory. Clay drums which are found also far to the south in the region of Chiriqui, Panama, occur.

Figurines Incense-burners Drums 306 B

Flint and obsidian forms 305 A B

The large series of flint implements, and of small flint and obsidian objects of eccentric forms seem to be peculiar to this region; indeed it is probable that the flint used in making implements found in Honduras came from British Honduras. Personal ornaments of shell, pottery, jadeite, and copper, are plentiful in this region. The ancient people had the custom of decorating the teeth by filing, and by inserting bits of worked hematite in small circular cavities cut in the enamel.

Personal ornaments

Decorated teeth 305 A

GUATEMALA

(Cases 300–303, 332)

Present Indians

IN many parts of the highlands of Guatemala the population is almost exclusively aboriginal, hence the Indian tongue is the only one heard. The natives still cling to many of their ancient customs, and their picturesque costumes are each characteristic of the locality. In the native dances, however, many Christian motives have been introduced, modifying them to some extent. The native medicine-men are greatly reverenced and feared. (See page 130.)

Costa Cuca pottery 301

Quetzaltenango pottery 300 B

Pottery origins 300–301

The archeological collections from Guatemala represent various phases of Mayan culture, chiefly from the western highlands, with a few specimens from the ruins of Quirigua in the Atlantic lowlands. From the hitherto unexplored area of Costa Cuca in the lowlands of the Pacific coast, the Museum obtained by excavation the collection of pottery vessels exhibited. The culture represented by these apparently penetrated the highlands of Quetzaltenango, the region of the Quiche, whence came the vessels displayed. In the general character of the earthenware of this Pacific coast and adjacent mountain area, one observes little in common with that of eastern Guatemala and the northern area of Mayan culture. Through this Pacific coast region Nahuan people strayed in their southward migration, and a colony remained there, the Pipil dialect of the Nahuan language being still spoken by a few Indians. Perhaps the receptacles and other pottery objects referred to should be attributed to the Nahua, although the Maya-Quiche have now overspread the western highlands. One of the noticeable features is the shoe-shape vessels, common in Oaxaca and very abundant in Nicaragua, but they are hardly known in other parts of Guatemala.

Pocomam earthenware 301 C

Especially local in character are the shallow plates, some of them decorated with spikes, which have been brought up in large numbers by divers from the bottom of Lake Amatitlan, a beautiful sheet of water lying slightly below and to the south of the highlands where Guatemala City is situated. This was the seat of the Pocomam of the Mayan family. From this culture area have come also the curious triped urns with masks, unique examples of which are displayed.

Pocomam and Cakchiquel

Mainly in the regions of the Pocomam and the Cakchiquel are found great numbers of human heads and figures of pottery, of archaic type, examples of which are exhibited. The sites where these occur most abundantly are around Lake Amatitlan, and the highland around Guatemala City and Antigua, the ancient capital. In this region have been found the only known examples of Mayan hieroglyphic writing in western Guatemala—a monolith near Guatemala City, and the globular stone pendant which was discovered near Antigua. The worn glyphs are of the cursive type found in the codices.

Glyphs 301 A

Sculptured vase 332

In the very center of southern Guatemala was found the splendid piece of ancient Mayan ceramic ware exhibited in a special case, the most beautiful example of aboriginal earthenware known to the Western Hemisphere. The excessively rare sculptured decoration is a triumph of native art of the best period of Mayan development. It was presented to the Museum by Mr. Harmon W. Hendricks, and has been described and illustrated in a special publication. (A reproduction of the design may be seen by drawing out the slide in the front of the case.)

Ornaments of jadeite are often found in this territory, the raw material probably having been procured not far away. In no other territory of America have been found so many cutting tools of chloromelanite, an extremely hard, greenish-black stone allied to jadeite. The only other places where this material was abundant are the Valley of Mexico and the State of Guerrero, the implements found in the valley having probably been introduced from the latter place.

Jadeite objects 302 A

Extensive quarries of obsidian occur in various parts of western Guatemala. Specimens of quarry refuse from near Fiscal, on the line of the railroad from Guatemala to Zacapa, are shown. Obsidian knives and other implements, such as scrapers and arrowheads, are common throughout the entire Mayan area, the source of the material being undoubtedly in the west.

Obsidian objects 303 A B

Many rude idols of different kinds of stone and of varying sizes are found. Some of the smaller images were worn as fetishes with a string of stone beads, recalling those of the Zapotec area of Oaxaca. A splendid sculpture of unique character, representing a Mayan deity, is displayed on the wall near Case 301; it is from the ruins of the ancient capital of the Quiche, was presented to the Museum by Mr. Rodman Wanamaker, and is the subject of a special description in one of the Museum publications. Certain curious mushroom-shape stones with three supporting feet are commonly supposed to be stools, but this interpretation of their use is not altogether satisfactory. The U-shape stone should be compared with similar objects from Vera Cruz. These

Stone idols 301 C 302 A 303 A B

Sculpture 303 D

U-shape stones 303 C 308 B

sculptures undoubtedly had their origin in the state named, the region of the Totonacans. Similar specimens have been found in Honduras and Salvador.

Metates 302 C D

Metates, or mealing-stones, in the form of animals, with either three or four legs, are peculiar to Nicaragua, Costa Rica, and Panama. Of rare occurrence in western Guatemala, they are unknown to the region northward (Mexico). The specimens exhibited, therefore, are of importance, as only two or three others have been found.

Club-like stones 303 A

Many large perforated stones, like club-heads, are common in this area. The biconical perforations, however, appear to be too small to admit a staff of sufficient diameter to be rigid enough to serve as a handle.

Stone heads 301 C

Chacmool type of statue 301 C

Censers 301 C

From the famous ruins of Quirigua in the lowlands of eastern Guatemala are exhibited several human heads carved in stone, which formed part of the decoration of one of the temples. The reclining human figure, unfortunately lacking the head, at the bottom of the case, is a representation of the Chacmool type of a Mayan deity, made known by Le Plongeon from the examples uncovered by him at the ruins of Chichen Itza in Yucatan. The same general type has been found in different parts of Mexico and in Salvador, and was supposed to have been a motive introduced into the Mayan region from the Nahuans of Mexico, but occurrence of this important specimen at Quirigua controverts this theory. The two fine censers, likewise from Quirigua, are worthy of study.

HONDURAS

(Case 307)

Honduras, one of the most important areas of Middle America from an archeological point of view, is also one of the most neglected fields of research. With the exception of the extreme northwestern portion, where are the remains of the Mayans and the famous city of Copan,—probably the southern limit of Mayan culture, —little is known concerning its antiquities. From Copan, and the valleys of the Chamelecon and Ulua rivers, has been gathered a wealth of antiquities. From the latter region the Museum has an important collection illustrating the advanced Maya culture, chiefly in ceramics. Many beautiful examples of polychrome and other types of pottery vessels are displayed. Among the unique objects of earthenware exhibited is the large "glazed-ware" whistling jar, the vent of which is in the back of the head of the effigy. By the movement of the water when the jar was filled, a clear note was produced. Pottery whistles, stamps, and small idols from Honduras are abundant.

Maya culture of Ulua valley

Pottery 307 A B

Many interesting examples of archaic art will be observed in the human figures and the heads therefrom, made of light-gray clay. As in kindred specimens from other parts, these are not hollow, but solid. One of the most interesting collections is that of the copper bells, and a turquois mosaic wooden mask from a cave near Chamelecon river. Many ornaments of a beautiful apple-green jadeite have been discovered in this region.

Human figures 307 D

Copper bells

Mosaic mask 307 E

Jade 307 F

Marble vessels 307 B An important feature is the small collection of marble vessels from the Ulua valley, among the most beautiful specimens of stone carving from aboriginal America. The marble was quarried from a known site in the vicinity, and no pieces have been found elsewhere. Stone vessels of a somewhat similar technic are found to the southward, in eastern Nicaragua.

Flint implements 305 A F Shell ornaments 307 F Well-shaped implements of flint, similar to those from British Honduras, are common, and the ancient people were as fond of beads and other shell ornaments as were those of the peninsula of Yucatan.

Trade Some of the specimens from Ulua valley, which could have had their origin only in distant regions, as Costa Rica and Vera Cruz, afford evidence of the extensive trade relations of the inhabitants of this small part of Honduras with those of other territories. Palmate or paddle-shape stones, like those from Vera Cruz, are the most significant objects exemplifying this trade.

Copan 307 C From the ruins of Copan there are a few interesting sculptures, the most important being an archaic greenstone idol found in that part of the ruins where the first buildings were erected. Potsherds of polychrome ware from Copan compare in every way with specimens from Ulua valley and from Salvador.

SALVADOR

(**Case 323 A B E F**)

Character SALVADOR, smallest of Central American republics, is a land contorted by every known form of volcanic action and subsequent erosion. Rugged mountains, gradually increasing in height toward the north, enclose fertile valleys, which for untold centuries have been the seats of dense habitation. The climate is very hot; the rainfall is not so heavy as on the north coast of Central America.

Indian population

The present population is largely of mixed blood, but perhaps twenty per cent are aborigines belonging to three linguistic stocks—Pipil, Lenca, and Matagalpa. The Pipil dwell in the western part of the country near Sonsonate and along the Balsam coast, until recently inaccessible. Formerly their eastern and northern boundary appears to have been the river Lempa. In eastern Salvador are a number of villages inhabited by Lenca Indians, who, unlike the Pipil, have for the greater part forgotten their native idiom. In addition two villages in the Lenca district speak a dialect of the Matagalpa tongue of Nicaragua. Before the Spanish conquest the Ulua of Nicaragua occupied also a few towns in Lenca territory, and two Maya dialects, Chorti and Pocomam, may have been spoken on the northwestern and western frontiers.

Ruins

The archeological ruins of Salvador consist of mounds and pyramids of earth and uncut stone. In the Pipil area these are often set out in an ordered plan, but in the east no preconceived form is evident. The largest and most important sites are La Asunción, Chalchuapa, Cuscatlan, Cara Sucia, Tehuacan, Tipa, and Quelepa.

Stone idols

Archeological objects consist chiefly of pottery and utensils of stone, but in the Pipil region stone idols of considerable size occur. The best known of these are the "Virgen" of Tazumal and a statue of the "Chacmool" type. Smaller idols are not uncommon and often have a curiously hunched back. Axes, pestles, mortars, metates, and other minor stone objects are found, likewise ornaments of jade.

Ceramics

The potters' art was highly developed in Salvador, but is dominated by the influence of neighboring cultures. The outstanding ceramic group consists of polychrome vessels—bowls and cylindrical jars of Maya type. The closest relationship is displayed with the art of Ulua valley in Honduras, rather than with the nearer (and probably more ancient) forms of the great city of Copan. A second large group is made up of figurines and associated effigy bottles which are dependent on the "Archaic" culture of the Valley of Mexico, which spreads southward across Guatemala to western Honduras and Salvador. Thirdly, there is a complex of figurines of sub-Maya type, and bowls and jars, often set on four legs and sometimes decorated with negative painting. These are attributed to the Lenca, as practically all come from Lenca territory. Finally occur figurines, whistles, and polychrome vessels which are distinctly related to the Pacific area of Nicaragua and which may be the handiwork of the Ulua, if not actual trade pieces from the south.

Minor wares

Such are the major divisions, but other and rarer ceramic types are known. Among these is Plumbate ware, in examples of which the Museum collection is unusually rich. This kind of pottery is distinguished by its semi-vitreous surface and lead or orange tone. Its distribution is from central Mexico to Panama, but it is everywhere rare. Although manufactured as early as the sixth century A.D., its focus and archeological significance are unsolved problems. Another small group includes vessels of Aztec type; among these are jars with faces of the rain god Tlaloc in low relief. Other minor wares, from our present state of knowledge, are of local importance and will not be discussed here.

In spite of the small size of the country, no carefully recorded excavation has been carried out, and the solution of general problems awaits more exact data. However, as a result of the Museum expedition of 1924 and a study of distribution of types, it is clear that almost all the Maya polychrome pottery falls in the Pipil area, and little else is found. From this it is deduced that the Pipil, eleventh-century immigrants from Mexico, conquered and absorbed the culture of the Mayan inhabitants. In eastern Salvador the dominant type is the "Archaic" of Mexico. The presence of intermediate forms shows blending with the pottery group here defined as Lenca. Aztec types are limited to several sites at which settled the Mexican allies of the Spanish conquerors.

NICARAGUA

(Case 331 A B E F)

NICARAGUA is the largest of the Central American republics. The Pacific side of the country is dominated by a chain of active volcanoes and geologically recently uplifted land which has impounded the waters of two great lakes. To the east of the lakes lie the older moun- Geography tains forming the continental backbone, which is cut by the overflow from the lakes. To the north is a series of plateaus embraced by the mountains. The Atlantic littoral consists of broad flood-plains cut by many rivers and sloping down to a series of lagoons and swamps. This region, known as the Mosquito coast, or Mosquitia, will be discussed in the following section.

Population

In ancient times the population centered, as it still centers, around the fertile basin of the great lakes. The earliest inhabitants were Chorotegans, who extended from the Gulf of Fonseca to the Gulf of Nicoya. The Chorotegan tongue is spoken also by two groups in southern Mexico. A second and smaller linguistic group, the Subtiaba, also is related to a Mexican tongue. A third element was formed by Nahua who had migrated from the Mexican plateau in the eleventh century and settled in Nicaragua about 1420 A.D.

On the east side of the lake lived tribes known to the ancient writers as Ulua or Chontal. They are said to have had a much lower culture than their neighbors, and a few of their descendants still live in great simplicity in the jungles today.

Historical accounts of the aborigines of Nicaragua show that while they lived on a plane below the great Indian civilizations, yet they had a well-ordered social system and elaborate regulation of their markets, laws, wars, marriages, religious festivals, etc. The land is extremely productive, and was described by the first Europeans who saw it as a Mahomet's paradise.

Large stone statues, attaining as great a height as 12 feet, are the outstanding feature of the archeology of the Pacific half of Nicaragua. Representing human forms in various attitudes, often with associated mythological animals, large numbers of these statues have been recorded near the great lakes. It has been possible to assign dates as early as the fifth century B.C. to some of these figures, and a study of their distribution shows that their makers, the Chorotega, once occupied a large part of Honduras.

Statues

Other objects of stone include elaborate metates, or mealing-stones, often of considerable size and abundantly decorated. Stone axes, bark-beaters, spear-thrower pegs, etc., are other finds.

Other stone objects

Pottery is exceedingly common. Most spectacular, perhaps, are the large urns in which the bodies or the bones of the dead were placed, together with the customary funerary accompaniments. Great cemeteries of these, placed side by side like eggs in a nest, have been uncovered near the lakes. Other ceramic types include a brilliant polychrome ware, and also a kind, known as Luna ware, marked by extreme delicacy of the designs. Also should be mentioned large incense-burners, usually capped by figures of mythological animals.

Ceramics

Archeological sites are exceedingly common and chance finds are frequent. The sites are often marked by mounds which served as foundations for the houses or were erected over burials.

MOSQUITIA

(Case 331 H)

Almost nothing is known of the antiquities of the Mosquitia coast of Honduras and Nicaragua. For the greater part their makers were Indians of low culture who dwelt along the coast or near the banks of the numerous rivers that drain this low territory of Central America. Even today the country is almost uninhabited by white men, and the small Indian population is widely scattered.

Sculptures

Four sculptures from this region are exhibited. The large stone tripod vessel is similar to some reported from the eastern slopes of the mountains to the westward, and they have been found also on the Bay islands off the coast. The three-legged metate is of the Pacific coast type. An interesting sculpture is that representing an armadillo. The monolithic axe points to influence from farther south. It seems probable that the makers of these objects borrowed many features of their culture from the Pacific coast tribes. So far we now know, there is nothing of Mayan origin in this region, although Mayan and the Mosquitia people were in close proximity.

Columbus discovered the coast of the Mosquitia on his fourth and last voyage to the New World in 1504, sailing from Honduras, where he first reached the mainland, eastward and southward as far as Panama. He reported people of a relatively high culture along the shores of the southern section of Mosquitia, but as yet no archeological investigations have been made in this part of Central America.

ARCHEOLOGY OF THE WEST INDIES

(Cases 316–319, 321, 322, 324–330)

NATIVE POPULATION

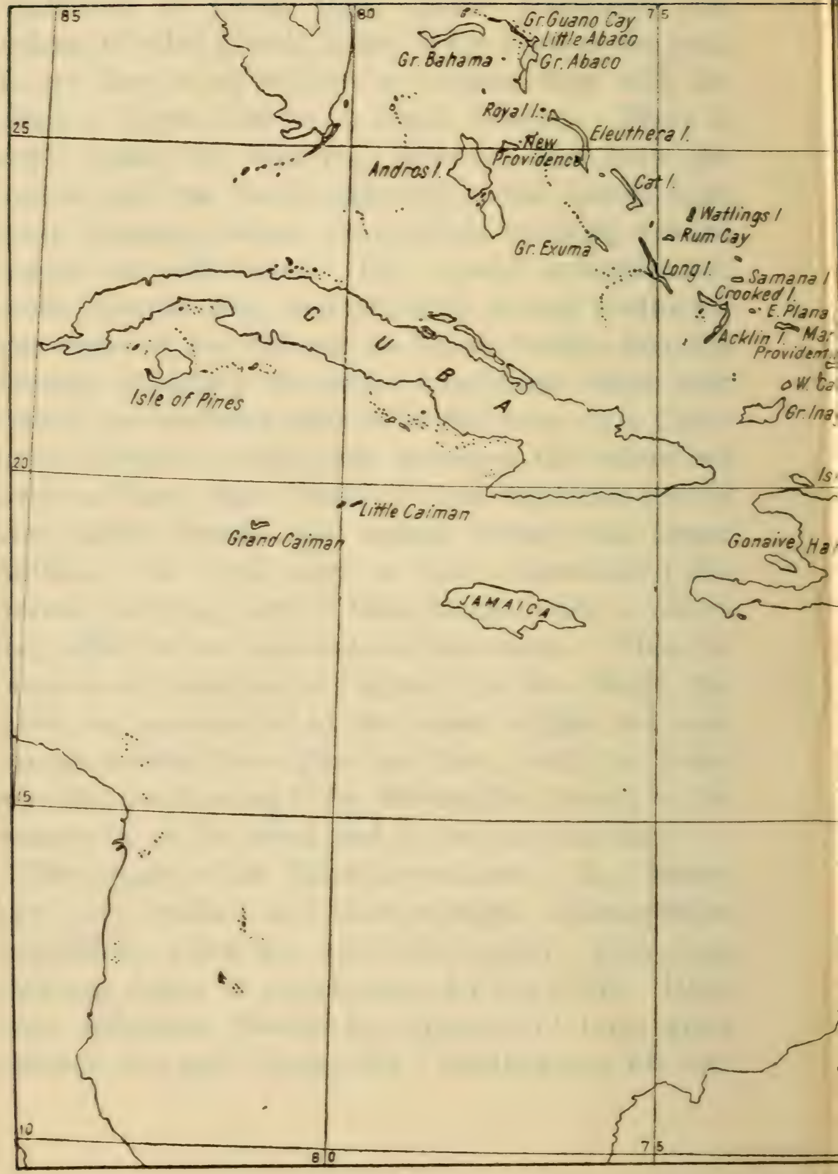
Early Indians

THE Indians of the Antilles possess an especial if melancholy interest in view of the fact that they were the first of the American aborigines to meet the white invader from overseas, and the first to lose their lands and to suffer virtual extermination at his hands. Columbus, and the early explorers following in his wake, found the Bahamas and the Greater Antilles (Cuba, Haiti, Porto Rico, and Jamaica) inhabited for the larger part by a number of peaceable agricultural tribes speaking similar dialects of the Arawak language, now grouped by students under the name of *Taino*. In the large islands of Cuba and Haiti were also found a very primitive group of Indians, in Cuba called *Ciboney*, which, although apparently at one period occupying large areas—the whole of Cuba, for instance,—by the time of the discovery survived only in certain isolated districts. These savages lived largely in caves, subsisting on natural products, without knowledge of agriculture, and were able to manufacture objects of only the simplest and crudest kinds. (See map, page 134.)

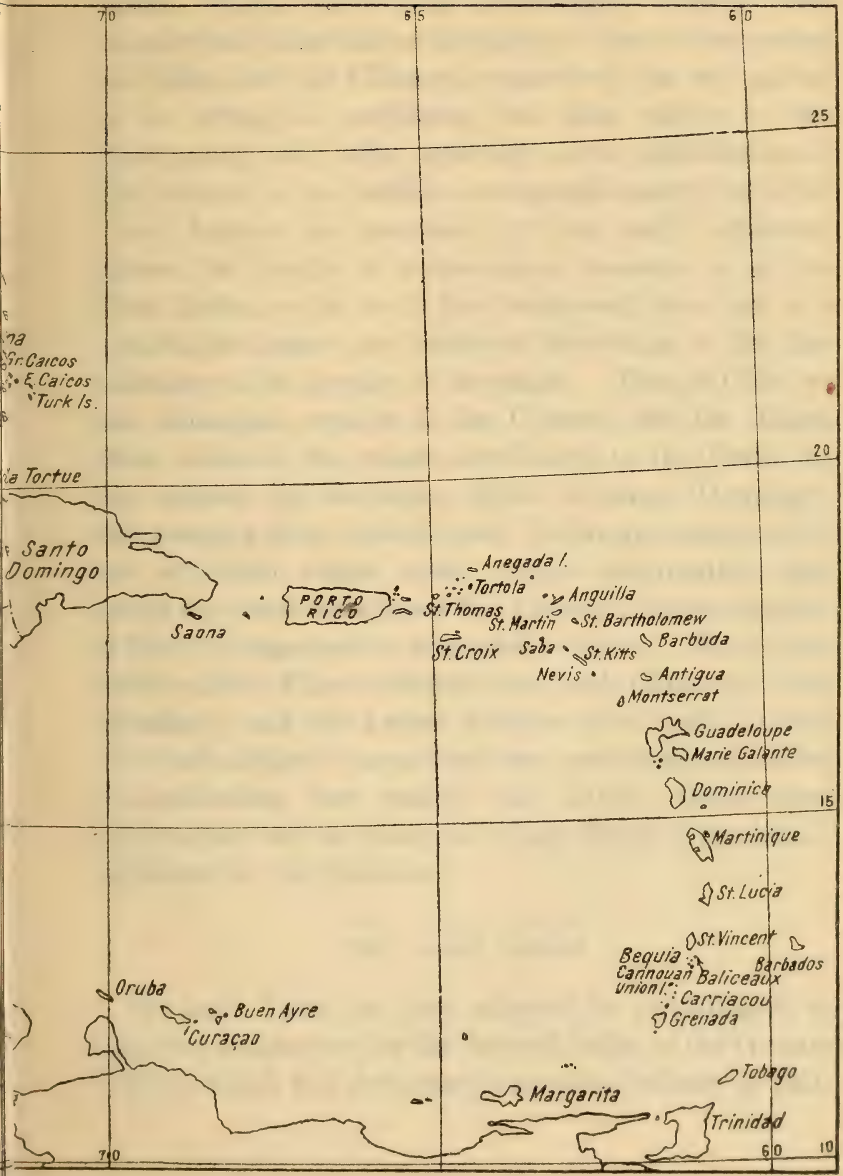
The Lesser Antilles were found to be occupied by a third group, the *Carib*, a fierce and bloodthirsty people whose continual piratical raids and notorious cannibalism struck terror to the hearts of their more peaceable neighbors. In spite of this, they seem to have practised agriculture, and were nearly as far advanced in the arts as the Taino tribes.

The origin of the Ciboney, apparently the earliest inhabitants of Cuba, Haiti (Santo Domingo), and perhaps of other islands, is lost in the mists of the past. As yet there is no evidence to connect them with the tribes of North, Central, or South America. There is every reason for believing, however, that both the Arawak and the Carib migrated to the islands from South America, where many tribes speaking related dialects are still found. The Arawak evidently left South America first, and gradually spread northward and westward, first through the Lesser Antilles, then the Greater, displacing the earlier inhabitants where such existed, and confining them to limited areas, as in Cuba. In the Greater Antilles they developed the culture we know as Taino; then a wave of Carib migration started from South America and spread through the Lesser Antilles. The Carib seem to have exterminated the Arawak bodily on some of these islands, while on others they killed the men and captured the women. When the caravels of Columbus first sighted the New World, the Carib had occupied all of the Lesser Antilles and were already raiding Porto Rico and Haiti, while the Taino were fast overrunning Cuba, driving the Ciboney to the western tip of the island and to the outlying keys.

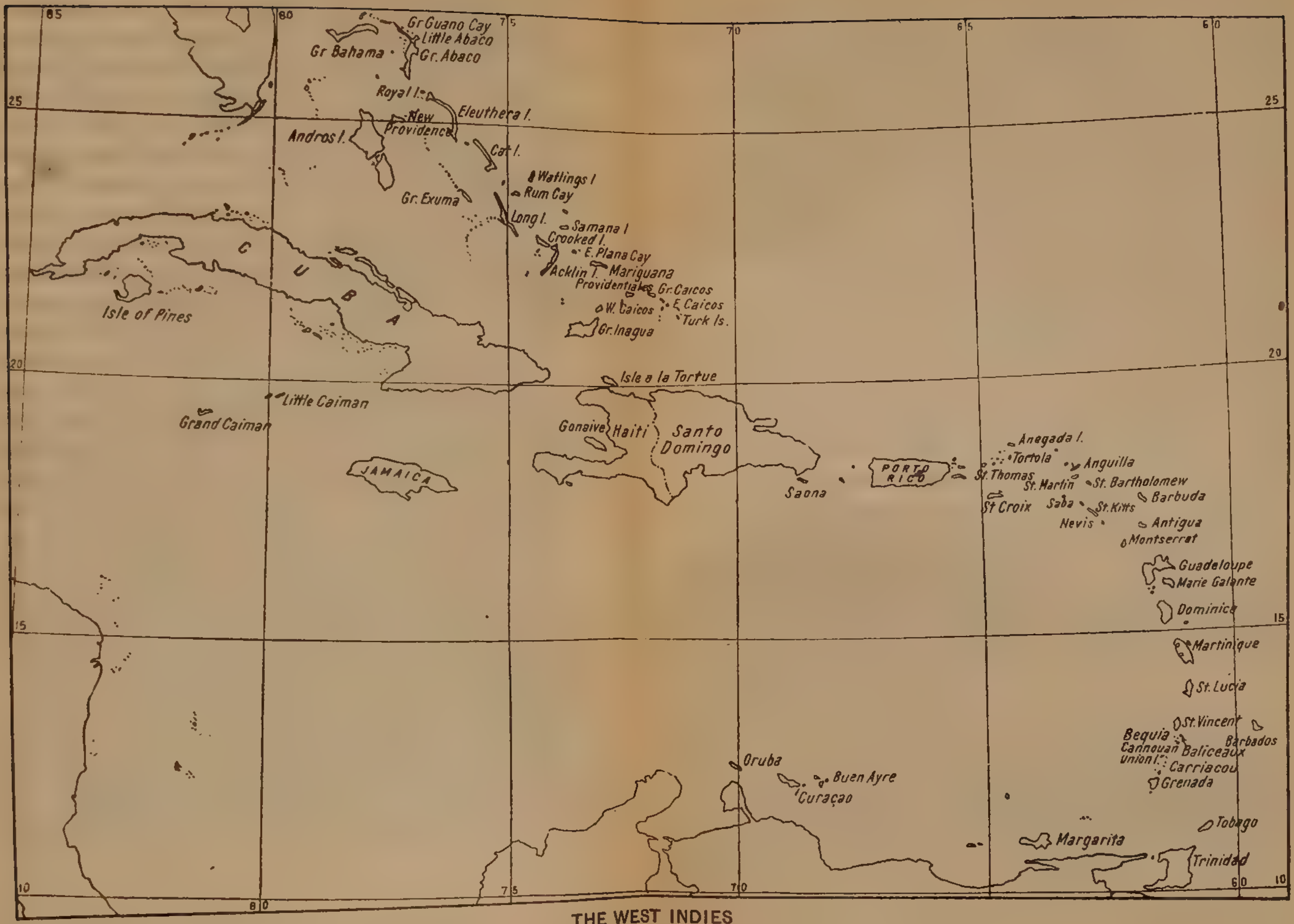
The remains of the Taino-Arawak and of the Ciboney have been studied and their principal characteristics established; which has not, unfortunately, been done with any degree of completeness for the Carib. However, archeology reveals the presence of three great cultures, and only three, and Columbus and his suc-


85
80
75
25
20
15
10
Gr. Guano Cay
Little Abaco
Gr. Bahama
Gr. Abaco
Royal I.
Eleuthera I.
New Providence
Andros I.
Cat I.
Watlings I
Rum Cay
Gr. Exuma
Long I.
Samana I
Crooked I.
E. Plana
Acklin I.
Mar
Providen
W. Ca
Gr. Ina
C U B A
Isle of Pines
Is
Little Caiman
Grand Caiman
Gonaive
Ha
JAMAICA

THE WE


70
65
60
25
20
15
10
Gr. Caicos
E. Caicos
Turk Is.
Tortue
Santo Domingo
Saona
PORTO RICO
Anegada I.
Tortola
St. Thomas
St. Croix
Anguilla
St. Martin
St. Bartholomew
Barbuda
Saba
St. Kitts
Nevis
Antigua
Montserrat
Guadeloupe
Marie Galante
Dominica
Martinique
St. Lucia
St. Vincent
Bequia
Barbados
Cannouan
Baliceaux
Union I.
Carriacou
Grenada
Oruba
Buen Ayre
Curaçao
Tobago
Margarita
Trinidad

INDIES



THE WEST INDIES

cessors found three kinds of Indians inhabiting the West Indies. Now, two of the archeological cultures have already been identified as belonging to two of the groups, the Taino and the Ciboney, respectively, so we can not go far wrong in attributing the third culture to the third group, the Carib, especially as the distribution of that culture in the Antilles corresponds exactly with the Carib habitat as described by the early explorers. Indeed the results of archeological research in all the West Indies, so far as it has progressed, bear out to a remarkable degree our historical knowledge of the distribution of the peoples in the region. Thus in Cuba we find abundant remains of the Ciboney and the Taino, while relics of the culture attributed to the Carib are rare indeed; the Bahamas, Haiti (or Santo Domingo), and Jamaica have yielded many Taino specimens, and a few of Carib origin, while future examination may reveal the crude remains of the Ciboney, whose presence in Haiti is suggested by historical evidence. Porto Rico yields mainly Taino artifacts, but Carib traces are fairly abundant; and the Lesser Antilles yield both Arawak and Carib objects—sometimes one, sometimes the other predominating, but mainly the latter. Much more information will be found in "Cuba Before Columbus," published by the Museum.

THE TAINO TRIBES

Meaning

The term *Taino* has been adopted by archeologists as a general designation for the Arawak tribes of the Greater Antilles which had developed a peculiar culture of their own. The name is derived from their own language, and means "good or peaceable men," as contrasted with the warlike and cannibalistic Carib. They made their living largely by raising corn or maize, cassava, and other native plants, and by fishing; but hunting, on account of the scarcity and the small size of most of the land animals, did not attain great importance. Most of their fishing was accomplished with nets, while clubs, or *macanas*, and javelins were the favorite weapons for hunting and for war. The bow and arrow, though existing in some localities, seem to have been little used by these people. The canoes which furnished them transportation were dug out from single logs and were often well made and large. These were propelled with pointed paddles.

Food

Weapons

Canoes

Their houses were circular or square in ground-plan, neatly made of poles thatched with palm-leaves and walled with thin sheets of bark-like material from certain palm trees; their beds were hammocks slung from the rafters. Very characteristic were the stools or seats of wood, known as *duhos*, often beautifully carved in human or animal form and inlaid with shell, and their handsomely decorated food vessels of wood and of pottery. The boiling of food was done in earthen pots set directly over the fire, and baskets of various forms and sizes, hung from the rafters, contained surplus provisions, trinkets, and the like.

Houses

Utensils

Peculiar graters made by driving innumerable bits of flint or other hard stone into the surface of a slab of wood were used for grating cassava-root into meal,

Cassava

while for squeezing out the poisonous juices from the grated root to fit it for human food a basket press was employed. Both grater and press are still used by the related tribes in South America, while the presses are still remembered by surviving Cuban Indians, who have employed also the ancient type of grater until recently. After grating and pressing, the meal was made into thin loaves or cakes and baked on a flat circular griddle, made of pottery or stone, fragments of which are still abundant on the sites of the ancient villages.

Stone implements

For wood-cutting and similar purposes these tribes used hatchet-blades or "celts" of stone, some of them, especially the petaloid type, of unusual beauty in form and finish, mounted in club-like wooden handles; while fine cutting and carving of wood, bone, and shell were accomplished with knives, scrapers, and crude drills, rudely made from flakes of flint, their knowledge of flint-working falling far behind that of other arts. Gritty stones were used for smoothing the work when finished.

Dress and Ornament

Clothing was little used, both men and women going practically naked but for tiny apron-like garments, such as are still worn by their relatives in South America; but a profusion of ornaments was employed, including beads and pendants of stone, shell, and bone, and circular earplugs of shell. Doubtless suitable seeds and nuts, and the feathers of tropical birds of brilliant plumage were also widely employed as personal ornaments, as in South America.

Art

The esthetic sense of the Taino was best expressed in their carvings, especially in wood and shell, the delicacy and symmetry of the work in some cases being unsurpassed in ancient America. The carvings in bone and stone are cruder, but still show a high degree of skill, as does much of the pottery. Objects may be decorated with purely geometric patterns, usually ovals or intricate scroll-like designs, or with effigies representing, in conventional form, men, animals, and supernatural beings, the latter especially being grotesque to the last degree.

Religion

Little of Taino religion or mythology is known, but there is historical evidence that these had reached a considerable stage of development, and that masks, images, and the like were widely used. Doubtless the stone "collars" and three-pointed *zemis* from Porto Rico, and the grotesque images and amulets found on other Taino islands, represent only a small part of their ceremonial equipment, the rest, of perishable materials, having been lost through decay.

THE CIBONEY

Food

From historical and archeological evidence, the Ciboney, apparently the earliest inhabitants of Cuba, and probably existing on the neighboring islands as well, subsisted solely on natural products without any knowledge of agriculture. Various fruits were eaten in season, and palm-nuts stored away for times of shortage, while land-crabs and shellfish formed a great part of the everyday diet. Fish and the flesh of the jutia and other small animals were also eaten; and there is some evidence that the now extinct megalocnus, a huge ground sloth, may have formed part of Ciboney diet in ancient times.

There is no definite knowledge of their weapons, but it is very probable that the bow and arrow were numbered among them. They seem to have made dugout canoes of ruder construction than those of the Taino. They occupied caves and rock-shelters wherever possible, and in such places their remains are frequently found; but also on occasion lived in camps in the open—probably in shelters of the rudest kind. Most of their deposits show no trace of pottery, but they seem to have had a little after contact with the Taino. However this may be, they made bowls of wood with the aid of fire, using gouges made of conch-shell to scrape away the charcoal as the work progressed, and turned conch-shells into serviceable bowls and dippers by pecking out the interior whorls and the core. The stone mortars and pitted hammerstones employed by the Ciboney were similar to those found throughout eastern North America, but their work in flint was very crude, consisting mainly of flake knives and rough scrapers. Axes or celts of stone and shell occur, but are rare and differ in form from Taino types.

Mode of life

Utensils

Stone tools

We know nothing of their dress, or lack of it. Their ornaments were disc beads fashioned of shell or of fish vertebræ, and pendants made from waterworn bits of shell or stone, and of sharks' teeth, perforated for suspension.

Ornaments

The only specimen known that may possibly illustrate the decorative art of the Ciboney is a carved wooden baton found in the mud of the bottom of a lake in western Cuba. The design consists entirely of dots Art and incised intersecting straight lines, and although neatly made, cannot be compared with the products of Taino art. It may have been used in ceremonies.

Nothing else relating to their ceremonial or religious life has apparently survived, unless the Ciboney may have been responsible for the exceedingly rude faces pecked on stalagmites in certain Cuban caves.

THE CARIB

As before stated, the Carib culture has not yet been fully worked out and defined, but we can be fairly certain that in general features (excepting always their piratical raids and their cannibalism, both characteristically Carib) their mode of life, dwellings, hammock-beds, use of cassava, and the like, were quite similar to those of the Taino.

The Carib were expert bowmen, however, which can not be said of the Taino, and the archeologist observes Character that they were much more given to painting their pottery than were the Taino, especially in red, black, and white; that the forms were somewhat different, and that the effigies used as handles and decorations for the earthen-Stone tools ware vessels have a fat, bloated look not seen in Taino ware. The Carib, moreover, preferred celts of ordinary type, or notched or grooved stone axes, or axes of fanciful form, to the petaloid celt-axe characteristic of the Taino; in fact, when petaloid celts are found on Carib islands they are probably either relics of the original

Arawak occupancy or were brought home as trophies by Carib raiders from Taino territory.

Carved wooden stools, idols of stone or wood, carved wooden platters, and stone collars, all familiar Taino artifacts, do not seem to have been made by the Carib, and are seldom seen in the Lesser Antilles, although the three-pointed *zemis* may have been occasionally imitated by them.

Ornaments

So few beads, amulets, and other articles of personal adornment appear in our collections from most of the Carib islands that one would naturally infer the Carib used few such articles, or that they made them of perishable materials. However, a collection recently obtained from the island of Montserrat seems to disprove this theory, for it includes many beads of semi-precious stones such as amethyst and carnelian, and pendants made of hard, jade-like materials. It is possible, therefore, that either collectors have overlooked such things on other Carib islands, or that Montserrat, in Indian days, was a special trade center for gems.

CUBA

(Cases 316 B C, 317 A–C)

Ciboney and Taino

In Cuba exploration by expeditions from the Museum thus far has revealed two principal cultures: (1) that of the primitive cave-dwelling Ciboney who were apparently the earliest inhabitants and lived in early times from one end of the island to the other; (2) that of the more advanced Taino who were long established only in the eastern end of the island, although just before the conquest they had overrun most of it. Thus it happens that although crude Ciboney specimens may be found in almost any part of Cuba, the remains of the Taino may be encountered in quantity only in the eastern portion.

Most of our Ciboney specimens were found buried in the floors of the caves where these people once lived, although some were discovered in the refuse-heaps marking their camp-sites. On the other hand, most of the Taino material was exhumed from village-sites, and only occasional specimens—usually fine objects hidden for safekeeping—were found in caves.

Pottery

Two full case panels and parts of two more are devoted to one of the most characteristic products of the Taino—their pottery. The range of form and design used by the Cuban bands is well illustrated, especially the almost endless variety of grotesque heads and figures used as handles for the vessels.

Stone objects

Equally characteristic of the Taino are the beautiful petaloid celts, of which a representative series is displayed, besides celts of forms which might have originated anywhere, and various forms of hammerstones, pestles, and other stone implements. The making of celts is illustrated by a series showing them in all stages of manufacture, together with the hammerstones used to batter and grind them into shape. The use of such celts as axes (hafted like the specimen from North Caicos, Case 319 B) is illustrated by a cut stick forming part of a rack in a burial cave. Also of stone are various fetishes, amulets, and beads, some of them beautifully made, and a few pitted stones, mortars, cassava griddles, weights, and the like.

Another characteristic Taino art is illustrated by specimens of woodcarving, including a paddle, part of an effigy representing a cayman or crocodile, and a beautifully carved platter, all found hidden in caves for safekeeping. The last two of these have evidently been inlaid at some time with mother-of-pearl. Wood-carving

The shell carving of the Taino was often excellent, as may be seen by the amulets and ornaments in the exhibit, while a series of tools and unfinished objects show how the work was done.. Shellwork

Objects of bone are not so abundant, but in the collection exhibited some of the pieces (especially the part of a bone platter and the fragments of spoons and swallow-sticks) exhibit considerable skill. Bone

The coming of the Spaniards and the beginning of the written historical period in general are illustrated by two specimens only—a rusty iron spear-head and a crumpled piece of sheet-copper. Spanish objects

The shell vessels, shell gouges, mortars, and pitted hammerstones, characteristic of the primitive Ciboney from both ends of the island, may be seen in the last panel, together with their beads and simple ornaments, their rude flints, and a few examples of their woodwork. Of the last, the baton with a carved handle is especially worthy of notice, as perhaps the only surviving example of Ciboney decorative art. This, with several other wooden objects, was found in the muck in the bottom of a lake in Pinar del Rio. Various Ciboney artifacts

Pottery

A small number of potsherds exhibited in this section, found in a few Ciboney caves, may indicate that in later days the primitive Ciboney people acquired some knowledge of the potter's art, perhaps from the invading Taino.

Carvings on stalagmites

Of unknown origin are the crude faces and figures on exhibition found carved on stalagmites in certain caves. They were probably used ceremonially, but whether the Ciboney or the Taino made them is impossible to say, although their rudeness would suggest the former.

JAMAICA

(Case 319 A–D)

Various objects

The upper two shelves of Case 319 and the space under it are devoted to a collection from Jamaica, all of which, except perhaps several large stone mortars, and the three-legged grinding stone or seat, seems to be easily identified as Taino. This seat may have been imported from the mainland; the mortars are of unusually large size, but they resemble some Cuban Ciboney mortars in form.

Pottery and Stone

An examination of the pottery reveals the fact that it bears a strong similarity to Cuban Taino ware, although somewhat simpler and cruder, on the whole, in form and design; the hatchets and ornaments are clearly similar to corresponding objects in Cuba.

Difference in artifacts

Perhaps the slight inferiority noticeable in Jamaican Taino remains, as compared with those of the other islands, may be due to the fact that Jamaica is somewhat isolated, and was not in continual touch with the specialized development of Taino culture in Cuba, Haiti (Santo Domingo), Porto Rico, and the Bahamas.

The explorations by the Museum expedition to this island have been described in "Certain Kitchen-middens in Jamaica."

BAHAMAS

(Case 319 A B)

Taino culture

A glance at the collection from the various islands of the great Bahama group lying north of Cuba, the names of which may be found on the accompanying map, shows that their culture was indistinguishable from that of the Cuban Taino.

Character of objects

Here we have the typical Taino petaloid celts, decoration on pottery, and amulets, some of the latter better than any we have from Cuba, and an excellent series of typical wooden seats, or *duhos*, two of them adorned with heads and one with intricate carvings like those of the Cuban wooden platter.

Celt with handle

Best of all is a fine petaloid celt with its wooden handle still intact, found in a cave on North Caicos island. That this was a usual method of hafting these stone axes may be seen from a monolithic hatchet from Grand Caicos carved from a single piece of stone to represent a petaloid stone celt in a similar wooden handle. A similar but ruder one was found in Providenciales.

Suggesting the presence of the Ciboney in the Bahamas are several shell gouges; and perhaps further investigation will establish the fact of their presence in these

Ciboney influence

islands before the coming of the Taino. The existence of a third and as yet unknown culture is suggested by the finding, in the Caicos group, of some extraordinary shell-tempered potsherds, highly decorated with incised straight lines and angles, unlike anything found elsewhere in the West Indies.

Pottery

SANTO DOMINGO

(**Cases 318 A–D, 321 A**)

Character of objects

The island of Santo Domingo, anciently called Haiti, and now occupied by the republics of Santo Domingo and Haiti, although only partially explored, has yielded a large collection consisting, for the greater part, of pottery and stonework, both to a large degree obviously of Taino origin and similar to the specimens found in Cuba and the Bahamas.

Pottery

Some of the pottery is better made than the average Cuban ware, and there is an even greater variety in form, yet the resemblance is very strong indeed. Special attention is called to the heart-shape water-bottles, a type not seen in Cuba at all, and the hollow human figures of earthenware, perhaps used as idols, of which only fragments were found in Cuba. Stamps for applying paint, made of earthenware, and in one case of stone, are abundant on this island.

Stonework

In stonework we have the little figurines or amulets, the beads, the pestles, and the petaloid celts characteristic of the Taino culture in Cuba, but in addition we find *zemis*, or "three-pointed fetishes," in the form of the human breast, which are thought to represent the God of Food or of Fertility; and the curious massive objects of stone, shaped like horse-collars, also thought to be fetishes. These last two classes of objects are especially characteristic of the Taino bands of Porto Rico.

Other noteworthy specimens in stone are a unique dagger or club, a carving representing a monkey, once apparently attached to a staff or handle of wood, a large flint implement, and two T-shape stones of unknown use.

Shell, Bone, Wood

Exhibited also are a few objects of shell and bone suggesting those of Cuba, and a small but interesting wooden idol, all typically Taino.

Carib objects

Carib culture is represented in the collection from this island only by a few axe-heads and perhaps the T-shape stones, and the Ciboney not at all; but further exploration will probably supply specimens of both, especially the latter.

The results of two expeditions to this island have been published by the Museum.

PORTO RICO

(Cases 321 B, 322 A)

Collars an Three-pointed stones

In the Porto Rico exhibit are seen the massive stone collars and the mammiform *zemis*, before mentioned as being the most characteristic of Taino products for this island, although found occasionally in Santo Domingo, and, rarely, in the Lesser Antilles.

As before stated, the *zemis*, or three-pointed stones, most of them made in the form of the human breast.

probably represent the God of Food or of Fertility, or maybe Mother Earth from whom the tribes of men draw their sustenance as the infant does from its mother's breast. They seem to have been considered powerful in producing large crops of yuca or cassava.

It is thought that the curious objects of stone resembling horse-collars, like the tri-pointed stones, were *zemis* or fetishes used in tree-worship, and that the earliest forms were of wood, made by bending a root or a pole into the form of an oval hoop and fastening the ends together. A more highly developed form was apparently compound, combining a wooden hoop with a so-called "elbow-stone," of which some specimens are exhibited, while the final stage was the collar, made entirely of stone, but still showing in many cases an attempt to represent characteristics of the wooden original.

Pottery

Much of the pottery is thoroughly Taino in character and might have come from Santo Domingo or Cuba, but Carib influence is seen in the red-painted ware and in the forms of some of the grotesque heads used as handles for vessels.

Stone objects

Wooden seat

Most of the stone axes in the collection from this island are either typical Taino petaloid celts or celts of more widely distributed forms; the stone beads and the like resemble those of Cuba. Especially worthy of note is the *duho*, or wooden seat, the back of which is higher than usual, and a tiny *duho* of stone made to represent the wooden type.

No trace of the Ciboney culture is seen in the collection, unless the few rude celt-like implements of shell may be attributed to it.

VIRGIN ISLANDS

(Cases 322 B, 324 B)

The Virgin Islands of the United States, including St. Thomas, St. Croix, St. John, and Tortola, have yielded to a Museum expedition a collection illustrating both the Arawak and the Carib cultures, the former doubtless representing the earlier occupancy, as the Carib seem to have been in full possession at the time of the Discovery. The rather crude character of the Arawak pottery would indicate this, too—it seems to represent a period before the Taino culture had attained the height of its development. Much of the pottery found on these islands is so plain, however, that it lacks distinguishing features serving to determine its origin. The distinctly Carib ware is recognizable as usual by its decoration in red or in red and white, and by the form of the grotesque heads. Especially interesting are several massive Carib bowls showing painted decoration on the inside.

Carib and Arawak

Pottery

One Taino stone collar was collected on St. Croix island, but this was probably a trophy from Porto Rico brought home by Carib raiders; and there are also two small rude mammiform *zemis* of Taino style. The stone axes show both the grooved and the notched forms of the Carib, the fine petaloid celts of the Arawak, and a number whose origin is doubtful.

Stonework

There are several objects of bone in the collection also—one of them the handle, carved in the form of a man, of some implement, probably a "swallow-stick," such as was thrust down the throat in certain ceremonies.

Bonework

This has inlaid shell eyes and mouth, and is an excellent specimen of Taino art.

The Ciboney are not represented in the collection, unless it may be that they made the shell celts displayed. It will take further exploration and study to determine whether this was the case, or whether the implements in question were the work of the Arawak or the Carib. It seems probable, however, in view of their increase in number as we pass down through the islands, that they are of Carib origin.

Further information may be found in "Archeology of the Virgin Islands," published by the Museum.

OTHER ISLANDS

(Case 324 A B)

From Anguilla and St. Eustatius the collection is small and has little character. From St. Kitts and Nevis most of the axes and pestles have a Carib appearance. On the other hand, we see two decidedly Arawak petaloid celts in the Antigua collection, and the four objects from St. Martin include one fine Taino *zemi*.

GUADALOUPE AND DOMINICA

(Case 324 A)

The larger collection from Guadaloupe, mainly stone axes, consists on the whole of distinctly Carib types; and here we first note the ornate forms of stone axe-heads so highly developed farther south; and the same may be said of the Dominica collection. In this the only object suggesting the possibility of Arawak origin is a solitary three-pointed object resembling in a general way a Taino *zemi*. This, however, is provided with the groove around the base which characterizes most objects of the kind found on Carib islands, and probably represents a Carib variant of the *zemi* idea.

MARTINIQUE

(Case 324 B)

The small collection from this island shows the Arawak petaloid celt and the Carib grooved or notched axe side by side.

SANTA LUCIA

(Case 325 B)

From Santa Lucia the collection consists mainly of stone axes, and ornate stone forms of unknown use. These are mainly pure Carib in type, except a few fine petaloid celts which might have, and probably did, come from Santo Domingo or Cuba, captured by Carib raiders.

MONTSERRAT

(Case 326)

Ornaments

The collection from the island of Montserrat is remarkable for its beads and ornaments of semi-precious stones, such as amethyst, jade, carnelian, turquois, and rock crystal, of especial interest being the jade amulets in the form of frogs, and the pendant carved of cannel coal to represent a human head. While most of the materials do not occur naturally on Montserrat, it is plain that at least a part of these articles were made on the island, for they are found in all stages of manufacture. How the Carib could have drilled such slender holes through such hard materials as amethyst, with the tools available to them in pre-colonial times, remains a mystery; but that they, and not some more advanced people from South America, did the work seems probable from the fact that nearly all the other archeological specimens found on Montserrat, both pottery and stonework, are typically Carib in style.

ST. VINCENT

(Cases 325 A B, 326, 327)

Carib culture

It is not until we reach St. Vincent that the remains of Carib culture at its highest stage of development are found. Here we find the typical massive though usually well-made pottery, the bloated appearance of the grotesque heads used as handles for the vessels, the extensive use of red, white, and black paint in decorating—in fact, all the distinguishing characteristics of Carib ware.

Pottery

Stonework

The stone implements, mainly axes, are equally typical of Carib culture, for the greater part notched or grooved, and some of them ornamented with decorative protuberances of varying forms. One especially ornate specimen, doubtless intended for ceremonial use, shows a carved openwork decoration on the poll, and others, effective designs on the blades. A handsome decorated dish of stone also figures in the collection.

There are also a number of crescent-shape, hook-like, and fanciful forms of stone to which no practical use can be assigned, although they are made of material hard enough to stand service as implements. Also exhibited (Case 326) are fanciful forms in stone too soft to have been of practical service for any purpose. Some of these represent the well-known axe-forms of the island, some the stone dishes, while others are entirely fanciful. They were found for the greater part in a single locality, and, it is thought, formed part of a ceremonial deposit of some sort.

Before leaving the subject of stone objects attention is called to the large mortars and grinding slabs, and the huge axe-heads too large for practical use, all exhibited beneath Case 327; also to the beads and amulets of stone which in most cases differ markedly from those of the Taino.

The only objects suggesting Taino styles in the collection are a few fine petaloid celts, perhaps brought home as war trophies. Some small three-pointed *zemis* show the groove around the base, characteristic of Carib objects of this class.

GRENADINES

(Case 328)

Carib culture

The collection from the Grenadine islands, including Baliceaux, Cannouan, Mustique, Bequia, Carriacou, Union I., and Little Martinique, shows practically the same culture as St. Vincent, for the greater part typically

Carib. Some of the three-pointed *zemis* have a Taino look, however, and there are a few petaloid celts.

Cannouan

The island of Cannouan, moreover, has yielded some exceedingly rude axe-like implements that suggest the presence of another and very primitive culture which should be further investigated.

Carriacou

Special attention is called to the curiously grotesque water-bottle of pottery from the island of Carriacou. Shell celts seem quite numerous in these islands, but their origin is as yet uncertain.

GRENADA

(Case 329 A B)

Carib culture

In Grenada the Carib culture is found still in its most exuberant form, with axes and pottery, and three-pointed stones with a basal groove, exactly as in St. Vincent; and here too are found abundant shell celts and occasional highly polished Taino petaloids. As in Cannouan, there are a few exceedingly crude axe-like implements suggesting a former primitive culture.

Another noticeable feature is the presence of several true adze-blades of stone with one flat and one convex side, an implement seen only occasionally on other Carib islands and not at all in the Taino district.

TRINIDAD

(Case 330 A B)

Character of objects

In Trinidad, the last of the chain of islands and nearest the South American coast, we still find Carib pottery at its highest point of development, but our collection contains fewer of the typical Carib axes, and a new form, but rarely seen in the other Carib islands, appears here—an axe with two sharply cut notches near the poll—a type characteristic of Venezuela and the Guianas. Attention is called to the excellent series of complete or nearly complete Carib pottery vessels, especially a unique bird-shape water-bottle.

The results of two expeditions to this island have been published by the Museum.

TOBAGO

(Case 329 C)

Stone objects

One would expect the island of Tobago, lying fairly near to Trinidad, to yield a full series of Carib artifacts, but such is not the case. The collection, on the contrary, comprises a large number of celts, including the petaloid, with very few axes, and one grooved three-pointed stone, recognized as Carib, and no pottery at all, while a plummet-like stone implement, not seen elsewhere in the islands, appears.

BARBADOS

(Case 329 C)

Carib and Arawak objects

The outlying island of Barbados, lying considerably to the eastward of the main archipelago of the Lesser Antilles, has yielded an unusually large collection of shell celts and gouges, some crude pottery, most of which is Carib, but few pieces of which appear to be Arawak, a typical Carib "hookstone," three Carib axes, and four celts, all of which last might be, as one certainly is, of Arawak origin. It is probable, therefore, that both Carib and Arawak occupied the island at different periods, but to solve this and other West Indian archeological problems, a great deal of further exploration and study will be needed.

EAST HALL

COSTA RICA

(Cases 334 A–D, 335 A B D E G–L, 336 A B, 337 A–C, 338 A B)

Various tribes

THE aboriginal inhabitants of Costa Rica belonged to three linguistic groups. The greater part of the country was inhabited by tribes speaking various dialects of Chibchan, a language which once extended from Colombia to Nicaragua. In Costa Rica it was spoken by several tribes in the south, known collectively as Talamancan. In the north the principal Chibchan tribes were the Guetar and the Corobici. In the extreme southeastern corner lived the Sigua, who told their Spanish conquerors that, having come to collect gold for Montezuma, they had settled there when they heard of the overthrow of that monarch by Cortés. Whether or not this tale be true, several early documents record the fact that they spoke a Nahuatl dialect. In the extreme northwest, around the modern town of Bagaces, lived another small group of Nahua-speaking people; they were surrounded by Chorotegans, of whom the most important tribes were the Orotiña, Nicoya, and Orosi. The Chorotegan tongue is found also in Nicaragua, Honduras, and southern Mexico.

General customs

Unfortunately no detailed and systematic description of the aborigines of Costa Rica exists, the references to them in early documents being meager. Their houses in general were built of heavy wooden frames covered with thatch. The Chibchan tribes lived in large circular houses which were occupied by several families, hence a small village might consist of only one house with thirty or forty occupants. The Chorotegan tribes had larger rectangular houses surrounding a plaza, on the sides of which were the temples and the residence of the chief. Agriculture was practised everywhere, and early accounts speak of plantations of maize, cotton, and cacao on land which today is dense jungle except for the United Fruit Company's clearings. Domestic animals included the dog, turkey, and tapir, the last being raised and perhaps bred in captivity on the Atlantic coast. Hunting supplied such animals as the peccary, deer, rabbit, armadillo, pisote, tepisquintli, and others.

Dress

The dress of the Chorotega is described as a breechcloth or skirt, and a sleeveless jacket made of cotton. The Chibchan tribes wore similar garments made either of cotton or of bark cloth. Examples of these, made recently by Talamancan Indians, are displayed. The Guetar women seen by Columbus wore their hair short, while the men had a long braid bound about the head. The Chorotega had long braids of hair hanging over the ears, except the warriors who had defeated an enemy in single combat; these wore merely a short tuft on the top of the head.

Hairdress

Manufactures

Cotton

The chief manufactures were cotton cloth, gold ornaments, mealing-stones, and pottery. Cotton cloth appears to have been well made in all parts of the country, but that from the Gulf of Nicoya was especially prized by both the natives and the Spaniards, owing to the dye extracted from a shellfish (*Purpura* *patula*), which resulted in a rich, soft color like Tyrian purple. The goldwork is practically indistinguishable from that of Chiriqui, exhibited in the West Hall. Dyeing Goldwork 331 C

The collections from Costa Rica were formed by Minor C. Keith, Esq., who generously presented to the Museum the bulk of his large gatherings, and the objects gathered by Mr. Alanson Skinner from the excavation of several sites in the Atlantic highland region. Only a small part of the total is displayed. For the specimens illustrating the relatively simple culture of the Bribri, see page 137. Bribri objects 336 A B

The archeological objects in the other cases devoted to Costa Rica were obtained chiefly from tombs. The Guetar tombs are rectangular stone enclosures covered with flat slabs. Burial accompaniments include the personal ornaments of the departed and such household utensils as pottery vessels, mealing-stones, etc. Interments were made under the house floors, and their presence today is often marked by circles of fallen stones against what remains of house walls. At some of the larger sites are rectangular or circular mounds which doubtless served for religious ceremonies, as the large stone idols exhibited were placed on the edges of their flat summits. The Chorotegan grave is usually not surrounded by a tomb, but is marked by a small superficial heap of stones. Urn burial, commonly found on the Pacific coast of Nicaragua, was practised in parts of the peninsula of Nicoya. Tombs Mounds Idols 334 A C

Some of the larger forms of stone objects recovered from graves are shown. On the top shelves of the case are metates or mealing-stones, and stools which they closely resemble. In general, the circular or four-legged Large stone objects 334 A-C forms are from the Atlantic coast, while the three-legged variety is from the Pacific area. Small stone statues and stone heads are common.

Jade
335 H I

Objects of jade and greenstone are found in northern Costa Rica, especially in Nicoya. These pieces are sometimes of great beauty and exhibit high technical skill in their making.

Pottery
335 B
337 A-C
338 A B

Pottery is exceedingly abundant everywhere. The types in the northwest are related to those of Nicaragua. In the central highlands the Guetar graves contain a polychrome ware, several types decorated with patterns painted in a single color, and a large group embellished with ribbons and buttons of clay. Southern Costa Rica produces ceramic types scarcely distinguishable from those of Chiriqui in Panama.

Status of Costa Rican art

Such, then, is the archeology of Costa Rica. For the layman its main attraction lies in the jade and in the more exotic objects of stone and pottery. For students, however, the chief interest centers in the fact that Costa Rica exhibits the transition from purely Central American culture to purely South American culture. The Costa Rican Indians, indeed, created no outstanding art of their own, but were content to borrow from their more civilized neighbors to the north and south.

PANAMA

(Cases 335 C F G, 339 B C, East Hall; 331, West Hall)

Chiriqui art

The province of Chiriqui in the Republic of Panama, geographically a part of the North American continent, is particularly rich in objects of ancient art, derived almost exclusively from graves and appearing to have been manufactured largely for mortuary purposes. These objects show that the ancient people were skilful in the manipulation of clay, stone, copper, and gold. It is apparent that in many respects the culture may be connected with that of the adjacent regions to the north in Costa Rica and Nicaragua, yet in other features it is remarkable for its individuality.

Metalwork
331 C
West Hall

Ornaments of stone were seldom used, but those of gold and copper were common. The gold objects were probably not mere personal ornaments, but were of a fetishistic nature. No weapons or utensils of metal have been found. The ornaments of metal were cast in molds, and gilding, or at least plating, was practised. The process of alloying also seems to have been understood. Only a few specimens of a large collection of gold objects are exhibited.

Pottery

In ceramic art the ancient people of Chiriqui reached a high plane of excellence, their pottery vessels being noted for perfection in technic, high specialization in form, and the conventional use of a wide range of decorative motives. The ornamentation applied in color, modeling, or incising, originated in life forms of animals (among which the armadillo, alligator, and octopus are prominent), which gradually were modified into conventional decorative devices, such as the meander, scroll, fret, etc. It has been possible to classify the ware into well-defined groups, each characterized by a typical form of decoration. The three main groups consist of unpainted, painted, and incised wares, the first two being divided respectively into four and ten

Biscuit ware 339 C

sub-groups. Of the unpainted group, the "biscuit" or armadillo ware is the most numerous and interesting, and in some respects it is almost if not quite the finest ware produced in aboriginal America. In the painted group the lost-color or negative-painting ware is the most numerous and important, and suggests contact with South America, as this process was widely employed in the inter-Andean region of Colombia and Ecuador. The characteristic decoration was produced by first covering the vessel or object with a red or a cream slip, or both; then the design was painted over the slip with wax, and the entire surface covered with black pigment; the vessel was then heated, by which process the black was removed from and with the waxed portion, and the design came out as a negative painting on the ground color.

Lost-color ware 339 C

In stonework the elaborately carved objects in the form of pumas exemplify a high degree of skill in fashioning what have been usually classed as metates or mealing-stones; but the researches of the Museum have shown that these stones closely approach the wooden seats, or *duhos*, still used in some parts of South America.

Stonework 335 C

ARCHEOLOGY OF SOUTH AMERICA

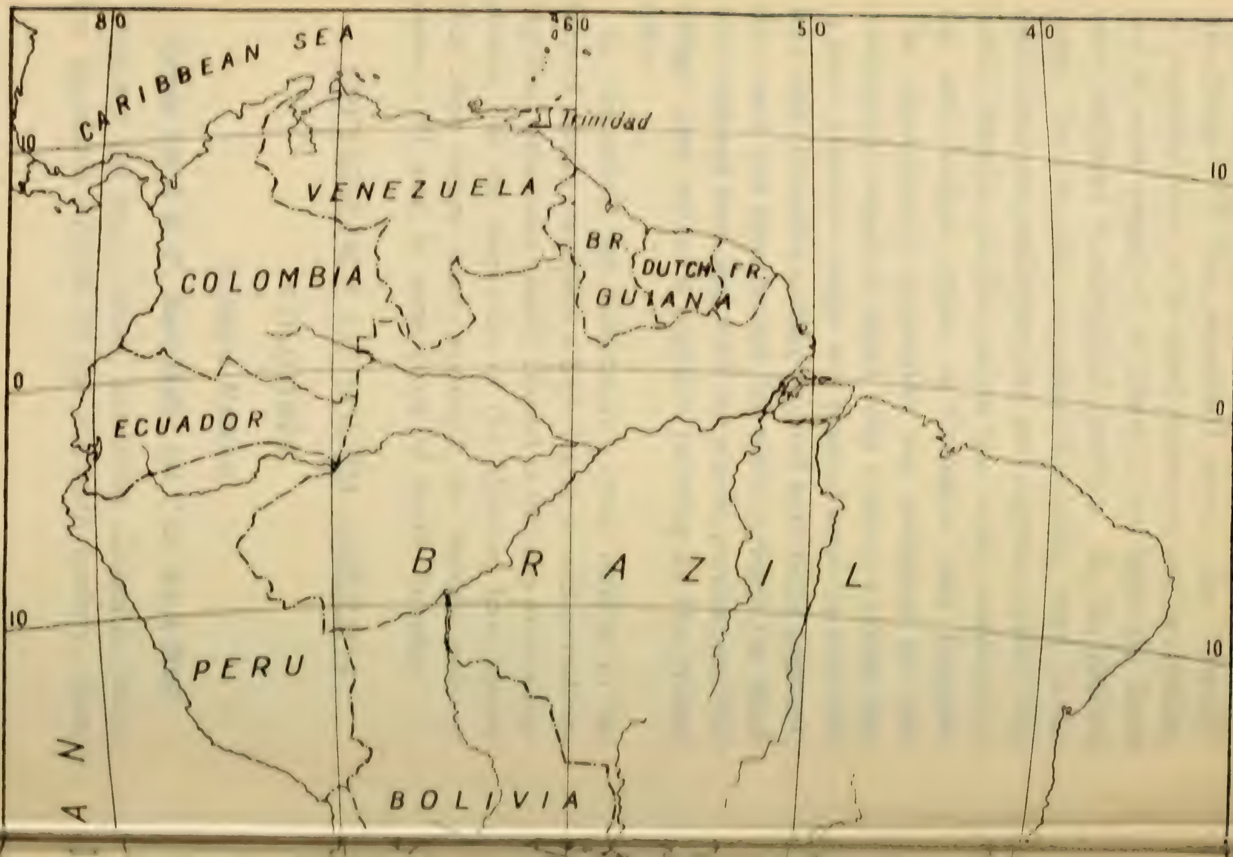
COLOMBIA

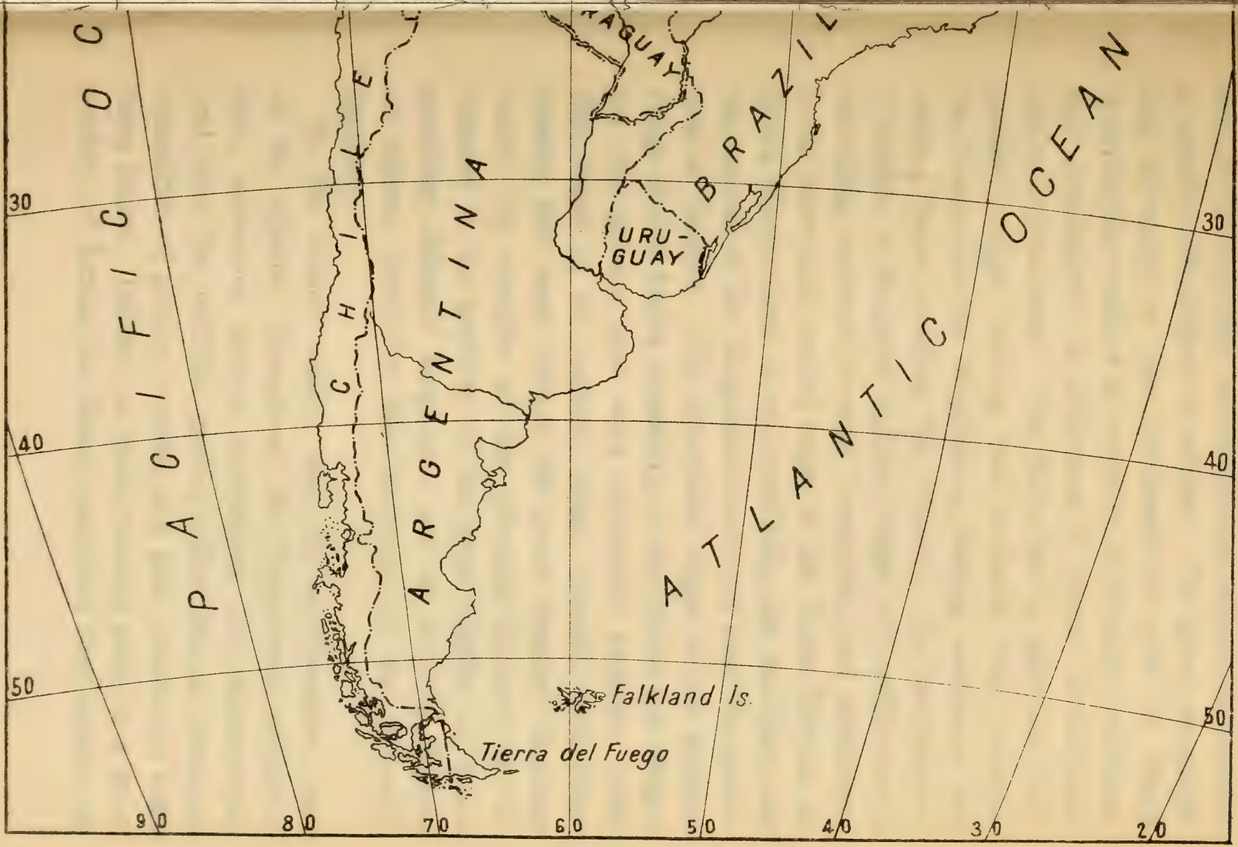
Andean Region

(Cases 339 A D–F, East Hall; 331 C D, West Hall)

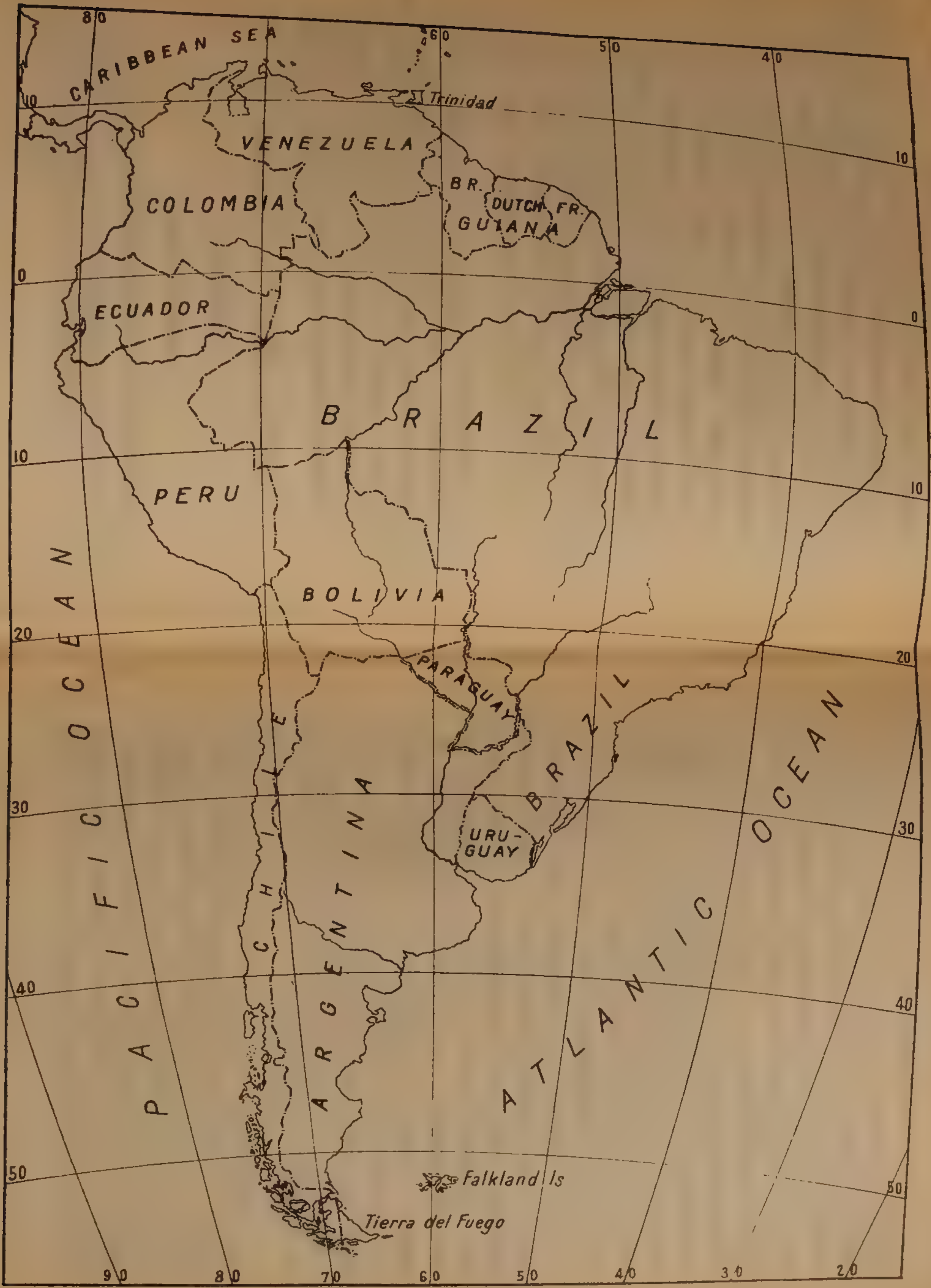
Physical features

Among the many tribes inhabiting Colombia when the Spaniards arrived in the sixteenth century, there


80
60
50
40
10
0
10
10
0
10
CARIBBEAN SEA
Trinidad
VENEZUELA
COLOMBIA
BR.
DUTCH
FR.
GUIANA
ECUADOR
B R A Z I L
PERU
BOLIVIA
AN



MAP OF SOUTH AMERICA



MAP OF SOUTH AMERICA

may be distinguished several groups which had attained a considerable degree of culture. The great geographical diversity of the northwestern part of South America has resulted in a variety of climatic conditions, and consequently in differences of native development due to environment. The Andes here is split into three parallel ranges, creating two extensive river systems, the Cauca and the Magdalena, flowing northward and uniting before reaching the Atlantic. In northeastern Colombia is the great highland region of Cundinamarca extending eastward toward Venezuela, and northward is the snow-clad coastal range of the Sierra Nevada de Santa Marta, close to and paralleling the sea from near the mouth of the Magdalena eastward over the peninsula of Goajira. The diversified slopes of the western range of the Andes extending to the Pacific are fringed for the greater part with mangrove swamps, while the slopes of the eastern range, covered with dense forests, fall away toward the great Amazon drainage basin. As complex as the physical features of the country is the problem of the great number of tribes speaking different languages and of varying degrees of culture, found by the Spaniards in the sixteenth century.

In the Cauca valley, and the northwestern part of the republic throughout the Department of Antioquia, numerous ancient settlements are encountered, and from the well-like graves, called *huacas*, immense quantities of pottery vessels and gold ornaments have been taken. Indeed, so much worked gold, in a great variety of forms, has been unearthed that search for

Indian graves by the natives has long been an industry in the Cauca valley and in other parts of the country. Yet, although the general character of the ceramic and goldsmith's arts, due to this activity, is fairly well established, the great field still remains to be investigated archeologically.

Quimbaya culture

Pottery 339 A D-F

Goldwork 331 C D West Hall

The pottery vessels and human figures exhibited are from the Department of Caldas, Cauca valley, and are now definitely known to have been the work of the extinct Quimbaya tribes, whose goldsmiths were the most skilful of all the ancient peoples of Colombia, taking rank with the Mexicans and the Peruvians in their product. They fashioned large vessels and canisters, and hollow human figures of beautiful workmanship in almost pure gold. Their pottery is of a distinctly local type; deeply incised or cut designs are common, and the presence of lost-color or negative painting in the decoration of many of the receptacles and figures suggests influence or contact from both Panama and Ecuador, and even the Peruvian coast. The modeling of the clay figures, some of which, made solid, were used as idols, and others hollow to serve as receptacles, does not equal that of their vessels and figures in gold; in fact, as a rule they are decidedly crude. Spindle-whorls of pottery and of stone have been found abundantly in various parts of Colombia, their beautifully engraved designs being characteristic of the respective localities. Some of the whorls served also as rattles. Stamps and roulettes of various shapes for ornamenting pottery occur.

Bark-bearer
339 D

A unique specimen is a stone bark-beater with handle, the only one from South America that has come to our notice. Such implements are found in Middle America, and many have been discovered in Oaxaca, Mexico. As the custom of making bark cloth prevailed in many parts of South America, it is probable that the beaters were generally made of wood, and hence have disappeared through decay.

Sinu
valley

Another region of Colombia once thickly inhabited is that of the valley of the Rio Sinu in the Department of Bolivar, in the extreme northwestern part, near the Isthmus of Panama. From the time of the conquest to the present, vast quantities of gold objects have been found in the ancient graves, some of the pieces being very large. It seems probable that more worked gold has been found here than in any other part of aboriginal America.

Chibcha

From the extensive region occupied by the Chibcha of the highlands of Cundinamarca the Museum has no adequate material, other than gold ornaments, to illustrate one of the reputed highest cultures in South America.

Stonework
(Middle
of hall)

In the upper Magdalena valley, near the village of San Agustin, are the remains of a culture which seems to have been confined to this restricted area. The antiquities are characterized by many massive stone sculptures of a type not found elsewhere. This isolated development of stone-carving marks one of the five small areas yet known in South America where that art flourished, namely, Manabí, Ecuador (represented in the Museum by the unique collection in the middle of the hall), Chavin in northern Peru, Vilcashuaman in southern Peru, and Tiahuanaco in Bolivia.

Tayrona culture 339 A

In the Santa Marta region, from the mountains to the Atlantic coast, the Tayrona, now practically extinct, formerly held sway. Some authorities assert that they were related to the Chibcha, while others include them as members of the Carib stock. Little is known of Tayrona culture, but from the few antiquities available it is certain that they were among the most accomplished workers in clay of ancient Colombia. Some whistles and figures with a peculiarly local type of engraved ornamentation are interesting products of their art. In this district have also been found large numbers of nicely-shaped beads, small idols, and various personal ornaments of carnelian and quartz crystal. The large jars on the top of the case were used for burial of the dead.

Pacific Coast Region

Nariño culture 346 A B 347 A-C

The ancient remains so abundant on the Pacific coast of Colombia have been investigated by two expeditions sent by the Museum to the southern Department of Nariño. For the reason that the culture is intimately related to that of Esmeraldas, Ecuador, the material is exhibited with that of the collections from the Ecuadorean coastlands, referred to on page 99.

ECUADOR

(Cases 340–345, 347 D–F, 348, 349 B C, 350 B, 353)

Environment

For its greater part Ecuador is ridged with lofty mountains, the Andean system extending from north to south through the length of the republic. The series of long, rather narrow, inter-Andean valleys are separated one from another by cross-ranges running approximately east-west between the two great enclosing western and eastern ranges. These ridges are in reality great highland plateaus known as *páramos*, with elevations of from 12,000 to 15,000 feet, while the highest snow-covered volcanic peaks of the great eastern and western barriers, such as Chimborazo, Cotopaxi, and Cayambe, are even more lofty. From the western range lower mountains slope gradually to within a short distance of the Pacific coastal plain. Few rivers of importance in this region flow into the Pacific, but it is watered by numerous small streams. East of the eastern sierra, in the great territory known as the Oriente, is a considerable series of ranges of lesser height, on the slopes of which innumerable streams have their source, all ultimately reaching the Amazon. The physical character of Ecuador had marked influence on the development and the migration of its ancient inhabitants.

Culture zones

In Ecuador there are three great zones, not climatic but cultural, for every variety of climate prevails. These culture zones are those of (1) the inter-Andean valleys, (2) the Pacific coast, and (3) the Oriente of the

Amazon basin. The ethnology of the Oriente must be considered apart from that of the mountains, for the people seem to have had close affiliation with those of the great forest area of the upper Amazon (see page 147). Little or no archeological material has thus far been found in this enormous and almost unexplored territory.

The archeology of the mountain region and of the coast appears to indicate two perhaps independent movements of people from Middle America, profoundly influenced by the widely different environment.

In the field of Ecuadorean archeology the Museum stands preëminent, owing to the field researches of the Marie Antoinette Heye Expedition, on the results of which the Museum has published two quarto volumes. By the excavations and collecting conducted by the expedition during a number of years, numerous artifacts have been assembled to illustrate the material culture of Ecuador, with the exception of the southern inter-Andean and coast regions adjoining the Peruvian frontier. On the coast extended excavations were made in mounds, locally known as *tolas*, and in graves and village-sites. The extensive and unique collections thus gathered are only partly displayed, the remainder being reserved for purposes of study. As a result of these investigations it is now possible to determine something of the character of the ancient culture of this part of South America.

INTER-ANDEAN REGION

(Cases 340–345, 350 B)

The archeology of the Andean region will first be considered. The rich collections from the interior are arranged geographically, beginning with the material from the northern province of Carchi on the Colombian frontier, and extending southward to the province of Loja adjoining Peru.

Jadeite 340 B

The aboriginal use of jadeite in Ecuador was unknown until the recent finding of an ornament, dull-green in color, resembling in this respect the nephrite of Brazil. Subsequently, from the province of Cañar, numerous small objects of this material, as well as a rough block with the characteristic marks made by severing small pieces for amulet-making, have been discovered.

Pottery (Various Ecuador cases)

Inca influence

Examination of the geographical groups of earthenware clearly reveals the styles of vessels developed in the various culture areas in pre-Inca times. Today all vestiges of the earlier aboriginal languages have disappeared, save where they survive in a comparatively few place-names, having been superseded by the Quichua language of the Inca, undoubtedly to a considerable extent since the Spanish occupancy of the country in the sixteenth century. In fact, the Inca entered the highlands of Ecuador only a generation or so before the advent of the Spaniards, or about the year 1450, extending their colonies and influence to a little north of the present city of Quito. Pottery of Inca origin is easily recognizable, being quite unlike that of the earlier tribes either in form or in decoration. It is found extensively in the southern and central parts of the highlands, but gradually disappears as one proceeds northward. The Inca pottery from Ecuador has been segregated and is exhibited with objects illustrating the culture of ancient Peru and Bolivia.

Interior cultures

Although numerous local cultures are represented in the interior, for general consideration we may distinguish three great culture areas in which the remains indicate a more or less centralized development, namely, (1) the area included in the three northern provinces of Carchi, Imbabura, and Pichincha; (2) the region near the volcanoes of Tunguragua and Chimborazo in the provinces of Tunguragua, Chimborazo, and Bolivar; (3) the southern area, in the provinces of Cañar, Azuay, and Loja.

Pottery from Carchi 341, 342

The most noteworthy feature of the ceramic art of the province of Carchi is the long, slender vessels peculiar to that area, found in large numbers in the deep, well-like tombs at Angel and vicinity. Associated with these are bowls painted with many motives of great interest in the study of aboriginal decorative art. Geometric patterns predominate, but the swastika, and bird and animal figures, also are found. Small, well-modeled olla-shape vessels, sometimes with fluted bodies, having birds, monkeys, frogs, and human figures facing each other from opposite sides of the rim, and often perforated for the insertion of carrying cords, are peculiar to the provinces of Carchi and Imbabura. Human figures sometimes on seats occur in this area, recalling the pottery figures of the coast province of

Manabí. Triple vessels with handles, tripod bowls, duck-shape receptacles, and others with a double spout, are occasionally encountered. Negative painting is common. Curious pottery trumpets and whistles in the form of sea-shells are peculiar to this region.

Pottery from Imbabura 343 B C

In many respects the earthenware from the next province, Imbabura, is related to that of Carchi, but certain types, such as the slender vases and painted bowls, are rarely found in Imbabura, hence the conjecture that the examples which occasionally have been taken from tombs in that province were introduced by trade. Certain other types, such as tripod vessels, duck-shape ollas with tripods, and a form of duck-shape vessel with two projecting stub handles in front and one behind, are found in such abundance that, if encountered elsewhere, their place of origin may be ascribed to this culture area. Small beautifully modeled and decorated receptacles are relatively common, and certain solid crudely modeled human figures are likewise found.

Gold figures

Pottery from Pichincha 343 D E 344 B 350 B

From Pichincha province the antiquities reveal a lesser degree of advancement in ceramic art, but for general classification the region may be included with Carchi and Imbabura, although it is far less rich in forms, while influence of the Inca is shown by the relative abundance of their pottery.

León pottery 350 B

The same is true of the province of León, where nearly all of the pottery gathered by the expedition is of Inca origin.

Southward, in the province of Tunguragua, one enters another distinct culture area, so far as may be

Pottery from Tunguragua 343 A F

judged by the pottery. To a certain extent it is related to that of Chimborazo, but here is found a distinct local development in ceramic art, characterized by vessels with thin walls, ornamented with straight or wavy parallel lines, often with a human face on the rim and rudely shaped arms raised below, but with no other part of the body represented. Such ware is found in great abundance within a limited area, but it is so rare in the adjoining provinces that it must have been introduced by trade. Another type is characterized by negative painting. A remarkable vessel representing an animal with massive stub legs and with a small olla on its back is displayed.

Pottery from Chimborazo 344 A B E F

Chimborazo, including the region of the city of Riobamba, is now reached. There was not the esthetic development in form and ornament found in the Carchi region, yet by reason of the great quantities of pottery beneath the surface, and the fact that excavations have revealed stratified culture sequence in the vicinity of Riobamba and around Ambato in the province of Tunguragua, the Chimborazo culture area is the most important of all the ancient centers of the Andes. A small collection illustrating the characteristic features of the ceramic art of these culture epochs is displayed.

Proto-Panzaleo I period

The earliest period, which lies at the bottom of the stratum, has been called Proto-Panzaleo I; its art is characterized by a profound influence from Central America. Tripod vessels appear, and the decoration consists almost wholly of engraved geometric patterns in parallel lines made with a comb-like instrument.

The next period, Proto-Panzaleo II, represents a development and continuation of the first period, the difference in style being not more marked than in the Transition Period between the Archaic and Teotihuacan of the Valley of Mexico. Marked traces of a new influence exerted from the north are shown, manifested in the appearance of negative painting (so common in Chiriqui, Panama) in the decoration of vases imitating melons, the employment of dragon-like figures, and the stylistic figures of bats on the rims of vessels.

Proto-Panzaleo II period

The third period is that of Tuncahuán. Not only is this epoch represented in the province of Chimborazo, but it extended throughout almost the entire inter-Andean region of Ecuador. Its culture, so far as the pottery is concerned, is characterized by (1) the disappearance of tripod vessels; (2) the relative abundance of negative painting in decoration, in which the octopus motive recently recognized in Chiriqui is found; and (2) the use of white in pottery ornamentation, which now first came into vogue. This third period seems to have been of short duration, and the immediate Middle American influence on the art of the ancient Ecuadoreans ends with this epoch. Objects of copper, absent from the first two periods, were introduced during the Tuncahuán epoch.

Tuncahuán period

The fourth Chimborazo epoch, that of San Sebastian, had many forms of pottery vessels common to the preceding periods; but new types appear, such as vases or cups with human faces in low relief on the sides, and plates with handles. During this period a slight

San Sebastian period

influence was probably exerted from the Tiahuanaco region far to the south, but there seems also to have been an intimate relationship with the culture of Cauca valley in Colombia. Progress was made also in architecture, as shown by ruins near Guano.

Elen-pata period 345 A B F

The art of the Chimborazo region reached its highest development during the fifth culture epoch, that of Elen-pata. Negative and positive painting of earthenware flourished, and jars with conventional human faces and arms, placed in low relief on the necks and upper body parts of the vessels, are characteristic. Pottery of this type has been found in great quantities in this restricted region, but thus far no examples have been discovered beyond. In many of the vessels human bones and innumerable small shell beads have been found, while in many others a mass of yellow powder revealed the sediment of *chicha*, showing that they had been filled with liquid for the refreshment of the departed with whom the receptacles were buried. Copper ornaments in large numbers are found.

The art of this period was developed exclusively in the territory of the provinces of Chimborazo, Tungurahua, and Bolivar, and seems unquestionably to belong to the Puruhá, who lived there at the time of the conquest. It was the outstanding culture epoch of this part of South America. The major portion of the collections from Chimborazo belong to this period.

Huavalac period

The last pre-Inca period was that of Huavalac, the material culture of which does not display wide differences from that of Elen-pata, although the two are distinguished stratigraphically. Lost-color ware is characteristic of the Huavalac period.

In the southern culture area, that of Cañar-Azuay and the province of Loja, the Museum has little to show the characteristic archeological features of a highly important region. Recent excavations have resulted in a wealth of material revealing a high degree of culture, showing marked Middle American influence. Here, as in no other part of Ecuador, architecture reached a high plane, as the ruins of splendid fortresses and edifices of stone attest. There was a very active Inca settlement of this area, the cities, notably Tomebamba, being among the most important of the 15th and the early part of the 16th centuries. A wealth of gold ornaments and implements have been found in tombs at Chordeleg and Sigsig, but the Museum collection of these objects from the latter site are not yet exhibited. Among the pieces are a massive gold crown with bangled golden plumes, a bracelet with bangles, "seals," breast ornaments, and several tips for ceremonial spear-throwers. Pan-pipes and other important objects found in Sigsig tombs were early assigned to the melting-pot.

Culture of Cañar-Azuay and Loja
345 D

Goldwork

Pacific Coast Region

The climatic conditions of the Pacific coast of Colombia and Ecuador are entirely different from those of the inter-Andean region. From the Rio Guapi in the department of Nariño, Colombia, to the mouth of Rio Santiago in the province of Esmeraldas, Ecuador, there is a broad stretch of low country extending westward from the foothills of the Andes, covered by a dense

Physical features

tropical forest and drained by many rivers. This area is bordered by a wide fringe of mangrove swamps crossed in all directions by innumerable small estuaries which conceal many islets. It is possible to travel by canoe practically the entire distance of several hundred miles between the Guapi and the Santiago, by way of this intricate system of natural canals, only occasionally skirting the ocean for short stretches.

On all the islands investigated are mounds and deposits, and along the banks of the streams are found the same conditions, telling the story of a continuous line of habitations in former times along the coast. Not knowing the name or names of its ancient inhabitants, this region is designated the area of the Esmeraldas culture; but this culture seems to have extended southward for a distance of at least 150 miles, where somewhat different geographic conditions are found. Beginning at the Rio Santiago, the coastal swamps disappear, the shore-line presenting a series of high bluffs alternating with or separated by plains, the bank along the beaches averaging 6 to 8 feet above highwater. In these banks occur numerous deposits of human artifacts.

In the province of Manabí the humid region extends southward to the region of the Bay of Caraques. From this area, only a few miles south of the equator, to Cape San Lorenzo, an arid belt is entered, the lowlands being desert-like, but the hills are clothed with tropical verdure. Southward from Cape San Lorenzo is another humid stretch, extending to 2° S. lat., where another arid zone reaches to the northern boundary of the Gulf of Guayaquil; here another humid zone is met, only to reach, in turn, the typical coast desert region at the Peruvian frontier. These strange alternating climatic conditions have an important bearing on the archeological problems that have arisen during the course of the Museum's explorations in the coastal region of Ecuador, problems that may be solved only through long-continued research. It seems probable that we must deal with two distinct peoples whose occupancy extended over a considerable period and whose highest development seemingly was reached long before the coming of the Spaniards. At present we have only glimpses of the comparatively high local attainments by the early inhabitants of the two culture areas.

Two coastal cultures

The collections from the Pacific coast indicate the former existence of two cultures differing widely from those represented by the artifacts from the highlands of Ecuador, where at least three major cultures may be distinguished, especially in the types of pottery found in the Andean valleys.

The northern coast culture, in the province of Esmeraldas, merges into the culture of the south Colombian coast region. The culture found in Manabí, in the vicinity of the equator, possessed individual characteristics indicating an intensive local development; but throughout the Ecuadorean coast there are traces of influence exerted from Central America, chiefly from the field of Mayan culture. Some evidences of contact with the pre-Inca people of the Peruvian coast are found, but there appears to have been slight connection between the coast peoples of Nariño, Esmeraldas, and Manabí, and those of the interior of Ecuador, so far as we may judge from the artifacts. If there was connection with the inter-Andean cultures, it was with the people of the interior of southern Colombia. The culture of the two coastal areas developed, as indicated, under widely different climatic conditions. In Nariño and Esmeraldas an exceedingly humid climate is found, with accompanying tropical vegetation; but in Manabí, for the greater part, the region is desert, except for tropical oases on the hilltops.

The collections from the Department of Nariño in Colombia, to which allusion has been made (page 90), represent the results of excavations made in the mound group on El Morro island near Tumaco, and in the deposits at Mataje on the Rio Mataje on the Ecuador frontier. Archeological material was found in abundance also along all of the numerous streams visited in this section, notably the Rosario, Caunupi, and Mexicano. Stone axes of various types are numerous, and deep, massive stone metates are characteristic of this culture area. Common also are deposits of broken vessels, the ware showing traces of having been painted red. The shapes of the vessels approach closely the forms found in Esmeraldas, the main difference being in the quality of the clay. Some of the human pottery figures are strikingly like those of the Quimbaya culture area in Cauca valley, but they lack the negative painting often found there. However, as practically all of the pottery from the coast has been badly affected by the extreme dampness of the soil, it is possible such negative painting may have disappeared. Some of the human effigy vessels and figures are of unquestioned Central American style, and might have been made within the area of Mayan culture. Several double-spout water vessels, on the contrary, must have originally drifted up the coast through trade with people having contact with Peruvian coast people. From the Mataje river deposits is a broken pottery slab, the direct prototype of the stone slabs from the Ecuadorean province of Manabí, the upper enframing section being identical. Such slabs are restricted to the Manabí culture area, the only exception being the Mataje specimen in clay. These will be described later. The single specimen of painted pottery vessel belongs to a unique class, so far as the decoration is concerned, although in form it is identical with vessels of a group from the provinces of Carchi and Imbabura in the interior of Ecuador. Other types of artifacts will be mentioned in treating the culture of Esmeraldas, where more abundant material was obtained.

ESMERALDAS CULTURE

(Cases 347 D–F, 353, 356 I–K)

In many respects the most interesting culture in Ecuador is that found on the shores of Esmeraldas and extending northward for a hundred miles. Remains of this culture are found also well up the numerous rivers that thus far have been investigated. The only researches, however, that have been conducted in this important region are those of this Museum, and doubtless scores of important sites still remain unknown.

The half-dozen expeditions of the Museum in this region have brought to light, by excavation and collecting, a most interesting aboriginal culture hitherto unknown.

Goldwork
331 D
West Hall

Prominent features of the Esmeraldas culture are the surprising advancement made in modeling human and animal figures in clay, and the remarkable achievement in the goldsmith's art. Not only was gold worked into a variety of beautiful jewelry, but a dominant feature of the art is the almost microscopic character of many of the objects fashioned in filigree; and a still more striking feature of the skill of the workers in the precious metals is the occurrence of jewels made of pure platinum or of platinum and gold filigree. In some examples objects were made of gold on one side and platinum on the other, while some little gold jewels are embellished with semi-precious stones as settings. Gold was employed also for decorating the teeth in various ways, notably by the insertion of small discs in perforations cut in the surface of the upper incisors, or by replacing the enamel cut from their outer faces with thin bands of gold. The art of inlaying points to Central American influence. Among the objects made of gold may be mentioned finger-rings (some of them set with semi-precious stones), nose-rings, earrings, bracelets, lip-ornaments, tacks or studs of gold of varying forms used to place in incisions in the face for decoration, fish-hooks, awls, and needles. Many of the innumerable small thin plates of gold with tiny holes were doubtless sewed on gala garments.

The great number of human and animals figures in the forms of idols or effigies of solid pottery, or hollow to serve as whistles, are generally of a type more Central American than South American in character. Most of the earthenware receptacles are simple in form, but many are ornamented with appliqué designs of a highly esthetic nature. These vessels, as well as the effigies, whistles, smoking-pipes, and other objects, may all have been painted red, but owing to the dampness of the ground in which they were buried, only a few examples showing the paint have survived. Pottery

Exhibited is a collection from the islet of La Tolita, explored by the Museum expedition during several summers. Over a large part of the island ancient deposits to a depth of six or more feet are encountered, and above ground an extensive group of mounds exist. Innumerable artifacts of gold, stone, and pottery have been exposed here in the process of recovering gold and platinum by the placer method. With the exception of slight excavations in two of them, the mounds have not yet been explored. In one, a remarkable treasure of gold was found in a clay chest, and in the other, among the specimens in a grave was a golden egg with a small emerald inside. The collection shown is only a small part of the material procured. The clay figures of human beings and birds and animals show a wide range of types, and customs and costumes of the ancient people are depicted by the specimens. In the human heads and faces are found all styles of treatment, from the archaic of Middle America to the most advanced and accurate modeling. Many of the pieces are so closely La Tolita 353 A I K L allied to Mayan artifacts as to be almost indistinguishable. Examples of the gold objects are exhibited in Case 331 of the West Hall. A single specimen of wooden human figure was found here; but as the objects thus far recovered were in swampy soil, great deterioration has resulted. There does not appear to be any culture stratification on the island, objects of all types being mixed indiscriminately.

Pottery tubes 353 J-L

In some parts of Esmeraldas enormous pottery tubes were superimposed over large ollas for burial purposes. In this manner many interments were made, recalling the well-like tombs of the Peruvian coast, the interior of Ecuador and Colombia, and the region of Chiriqui in Panama. All burials were not thus made, however, as the numerous *tolas*, or mounds, were used also for sepulture.

It is believed that the Esmeraldas culture area is one of the most important in South America for the study of the southward migrations of Middle American peoples, the type of culture found being intermediate between the Mayan and that of the Peruvian coast.

MANABÍ CULTURE

(Cases 348, 349 A–C)

Sculpture

An outstanding feature of the Manabí culture is the development of sculpture in stone, for such is almost unknown in the interior, and is entirely absent in Esmeraldas. The Manabí sculptures have been found in association with the ruins of houses in hilltop cities and in a few sites in the arid plains.

Stone seats

Of first interest and importance are the seats, of which the Museum has a large collection (exhibited on the pyramid in the middle of the hall). They were gathered from a number of hilltop cities, and have never been found beyond a restricted area of about 20 miles in diameter. From their occurrence in numbers at dwelling sites, it is believed that these seats were used ceremonially in household sanctuaries, and that they represent the transition of the utilitarian wooden seats into stone seats having a religious significance. Of next importance are the sculptured slabs found in connection with the seats (displayed on the columns at the north side of the hall). It is apparent that these bas-reliefs were not nearly so numerous as the seats, but the motives may be divided into a number of clearly distinct groups, prominent among which are the representations of female deities, a complex animal figure with octopus-like characters (a kind of sea-monster), and a combination of disc and crescent motives. Stone columns recalling those of Costa Rica, animals on columns, representations of birds and animals, and human figures, round out a group of sculptures unique in South America. A curious feature of the archeology of the Manabí region, where sculpture in stone was so highly developed, is the scarcity of stone implements, for axes and celts are almost never seen, although hammerstones are abundant. On the contrary, in Esmeraldas, especially in the interior, where practically no sculptures are found, innumerable tools of this character and in an infinite variety of forms are encountered. Another noteworthy feature

Sculptured stone slabs

Stone implements 353 G

is the entire absence of arrowpoints and spearpoints in the culture areas of Manabí and Esmeraldas, indicating the use of the blowgun with bone-tipped darts. The peculiar stone hooks for spear-throwers, so common in the interior, are not found on the coast.

At the house sites numerous flat slabs and handstones used in grinding have been found; indeed the natives today use these stones which they recover from the ruins. None with legs, like whose of the Central American metates, have been discovered.

An interesting exhibit consists of engraved stones from the island of La Plata, off the Manabí coast. These are supposed to be record stones.

Pottery
348, 349 B C

In ceramics the explorations by the Museum have brought to light an important array of vessels, effigies of human figures on seats, small figures, whistles of many forms and sizes, stamps, molds, and thousands of engraved spindle-whorls, all indicating a peculiarly local culture, but pointing clearly to northern rather than to southern influence. Undoubtedly wood was extensively used in various ways for making seats, idols, and household furniture, but products of the art of woodcarving as well as of weaving have entirely disappeared.

Other
artifacts

A few pieces of copper and some ornaments of gilded copper are the only examples that have been discovered thus far to show the metalwork of the ancients of Manabí. Objects of bone and shell are comparatively rare.

Burial
customs

In the hilltop cities, as well as in those of the arid plains, the dead were deposited in bottle-shape tombs cut into the solid rock, as well as in the *tolas*, or mounds.

THE GUIANAS AND VENEZUELA

(Case 373)

Physical features

Less definite information is available concerning the archeology of French, Dutch, and British Guiana, and of Venezuela, than of any other portion of South America. The climate and topography of Venezuela are as varied as those of Colombia, of which it is geographically an extension. The Guianas are crossed from south to north by a great network of rivers; the country is low and the climate humid. In the interior are highlands and many grassy plains or savannas, great portions of which are unexplored, and of which next to nothing is known concerning the archeology and ethnology.

Arawak and Carib

Probably Chibcha influence extended into western Venezuela, but over large tracts the Arawak and Carib held sway at the coming of the whites. The latter tribes were also the two known peoples of the Guianas, and the impress of their migration into the West Indies was indelibly made in those islands.

Timote

In the vicinity of Merida, in the Venezuelan Andes, were the Timote, a tribe apparently independent of the other stocks of northern South America, so far as known, although it has been asserted that they were related to the Chibcha. As in many other parts of the continent, the language has disappeared, and only by comparative archeological research and a study of skeletal remains will it be possible to determine affiliations. The Timote had attained a considerable degree of culture, seemingly the most advanced in Venezuela, judging by the meager archeological material available.

The most abundant ancient remains are found in numerous small mounds and burial places in the vicinity of Lake Valencia in the Aragua valley, southwest of Caracas. This region has been placed within the Carib area, but as no trace of the language of the people has survived, their connections can be determined only by archeological study.

Pottery
Stone
Shell

A collection from this region, mainly of pottery, stone, and shell, is exhibited. The heads of the numerous human figures of pottery recall the archaic art of the Valley of Mexico. Animal heads adorn the rims of vessels, often projecting above the edge, showing distinct connection with the people of the West Indies, either Arawak or Carib. The art generally is rather crude, and is characteristic of this northern area of South America, extending through the Guianas to the mouth of the Amazon.

Margarita
island

From the island of Margarita are exhibited the gatherings from excavations conducted by a Museum expedition, the only scientific work of the kind thus far carried on in Venezuelan territory, a report on which has been published. Carib influence is clearly shown in the pottery, some pieces being identical with earthenware from Trinidad and other Antillean islands. Large breast-ornaments cut from the lips of conch-shells resemble specimens of stone, some quite large, of a form peculiar to the Venezuelan Andes. Free use of shell for ornaments is a common aboriginal feature of this region, which in many respects is the most important unworked field in South American archeology, for from this area the West Indies was unquestionably peopled.

BRAZIL

(Case 356)

THE territory forming the Republic of Brazil is somewhat larger in area than the United States, exclusive of Alaska, for it occupies nearly half of the land area of the Southern continent. At the time of its discovery in 1500, this region was inhabited by numerous Indian tribes, but from its extended seacoast the Indian population has now either almost disappeared or has become practically merged with the blacks whose ancestors were brought from Africa as slaves. A considerable Indian population still lives in the great remote interior parts of the republic, preserving the aboriginal habits, customs, and ceremonies of ancient times.

Various tribes

Two principal groups of aborigines have been distinguished in central and southern Brazil. The Tapuya, or Ges, who are supposed to be the more primitive of the early inhabitants, buried their dead in large earthenware urns, called *igacaras*, with inverted bowl covers. They excelled in flaking stone implements. The present Botocudo belong to the same stock, although they are said to be of lower culture than the other group. Certain skulls found in Lagoa Santa are attributed to them. The Tupi-Guarani occupied a far greater part of the area under consideration. From the region of the Amazon valley northward to the boundaries of the Guianas and Venezuela were the Carib and Arawak, who extended also through the Antilles. The Carib are now known to have come originally from western Brazil.

while the Arawak are believed to have had their first settlements in the region a little to the north of the Carib. In the area occupied by one or the other of these tribes it is probable that the native manioc, one of the great food-roots of ancient America, was first cultivated.

For reasons which cannot be presented here, it seems highly probable that the greater part of the vast region under consideration, specifically its southern part, was not occupied for so long a time as the Pacific coast and the inter-Andean valleys. Indeed it is reasonable to conjecture that the southern Brazilian area and portions of the Argentine Republic were the latest parts of the continent to be permanently settled, if it is considered that the logical route of early migration southward from Central America was probably along the Pacific coast, or through the Andean valleys, or both. There seems to have been, at the time of the earliest aboriginal invasion of South America, a movement eastward from Panama, along the northern coast of the continent, through Colombia, Venezuela, and the Guianas, which reached the mouth of the Amazon and ascended that stream; and there may also have been a contemporaneous filtration of people southward by way of the numerous waterways which drain into the Caribbean sea.

Migration

With such a paucity of information concerning the native Brazilian tribes and their former migrations, it seems almost hopeless to connect with either the Tapuya or the Tupi-Guarani, in any certain degree, the meager relics of antiquity, for the linguistic map of the region exhibits a perplexing intermingling of tribes. The entire region from the mouth of the Amazon southward to the frontiers of Uruguay, Argentine, and Paraguay, and westward to Bolivia, is less known archeologically than any portion of the Western Hemisphere.

Various objects

The only archeological collection in the United States from southern Brazil is here exhibited. It is mainly from the states of Santa Catharina, Minas Geraes, and Matto Grosso, but there are also specimens from other southern Brazilian states. Pottery is excessively rare; one specimen of the coiled variety recalls the ware of the Pueblo region of the United States. Stone axes and celts are very common; many of these are of fibrolite, a material not used elsewhere in South America, but it was employed for implement-making in Arizona and New Mexico. Long T-shape lip-ornaments, called *tembetas*, some of them made of quartz crystal and beryl, are characteristic of the Brazilian culture areas. Artifacts of nephrite are rather common in Brazil; the only known locality where this material occurs *in situ* is near Amargoza in the state of Bahia, about the central part of the coast region. With the single exception of a small idol from northern Ecuador, no objects of jadeite or of nephrite have been reported from any other part of South America, the nearest place of occurrence being Costa Rica. A nephrite celt from Minas Geraes is exhibited. Mortars of zoömorphic forms are peculiar to certain sections of southern Brazil, and pestles are rather numerous. Skilfully chipped arrow- and spear-heads of quartz crystal are among the most highly finished objects of this class from South America. Although limited in number, the artifacts prove that the ancient Brazilians were not exceeded by any of the more advanced people of the continent in the making of implements and ornaments of stone.

The only region of Brazil in which antiquities are found in abundance is that of the lower reaches of the Amazon, especially on the island of Marajo near its mouth. Here an enormous number of painted and incised pottery vessels, as well as effigies, stools, and other objects, have been discovered in burial mounds and on village-sites. These artifacts, of a peculiarly local type, are evidently the product of a people which achieved the highest culture of any of the South American Indians east of the Andes. Resemblances are traceable between the art of this region and that of the natives of British Guiana, the island of Trinidad, and the Lesser Antilles, probably because it represents the work of an Arawak-speaking people. One of the large burial jars from Marajo island is exhibited on the pyramid in the center of the hall. Certain traces of the decorative art of this culture area are seen in the pottery made today by some of the tribes of the upper Amazon, such as the Conebo, and even in the Oriente region of Ecuador and the interior of the Guianas.

Pottery

PERU

(Cases 349 A D–F, 350 A B, 351, 354)

General features

The diversified geographical features of Colombia and Ecuador are repeated in Peru. The great western cordillera of the Andes, however, extends close to the sea, leaving a coastal plain across which are many narrow valleys, through which small rivers flow to the Pacific.

This entire stretch of coast, except for the narrow strips watered by the streams, is a parched and rainless region. In it are numberless ancient cemeteries, in which have been preserved, to a degree not found elsewhere in the Western Hemisphere, everything that was buried in the graves hollowed in the nitrous sands. It was the habit of the pre-Inca to bury with their elaborately mummified dead not only personal ornaments, paraphernalia, and tools of trade or profession, as well as all kinds of food, but to place in the graves pottery vessels on which are depicted, by either modeling or painting, nearly every known object connected with their life. The modes of burial varied almost endlessly, and from great formality in the beginning they seem to have grown more and more simple. Hence, owing to the unusual natural conditions and to native customs, certain phases of the aboriginal life may be studied, which are missing from other culture areas, where the artifacts have perished through decay or because the natives did not reproduce in their ceramics the objects known to them. It may be asserted that little relating to the material culture of the ancient inhabitants of the Peruvian coast has been lost, for we possess greater knowledge of their arts and crafts than of any other ancient aboriginal American people. Textiles, of which we know next to nothing in Middle America, are here preserved in marvelous condition, some of the most delicate and ornate fabrics having suffered little or no deterioration either in color or in texture.

When the Spaniards made their advent in Peru early in the sixteenth century, they found a flourishing civili-

Inca culture

zation, knowledge of which has come down to us under the name Inca. The people lived in highly organized states, with a well-ordered government. Religious structures and other buildings of adobe bricks or of stone, many of great size and splendor, abounded in the numerous well-populated cities, both on the seacoast and in the inter-tropical mountain region, the great valleys of the Andes. Well-built roads traversed certain districts of the country, and arts and crafts were developed to a high degree of excellence. The coast people carried on an extensive commerce; rafts with sails navigated the seas, while the mountain people had domesticated the llama which served as a beast of burden in the highlands. Agriculture had been brought to a high plane in both regions, and along the coast an elaborate system of canals and aqueducts conducted water from the mountains to irrigate the almost desert valleys. Where the watercourses became dry during a great part of the year, reservoirs of enormous size are found.

In the great narrow valleys in the Andes, where better crops could be raised than in the lower tropical or desert lands, every available spot was cultivated, and naturally cultivable areas were augmented by the building of terraces on the steep slopes of the higher valleys, as well as on those facing the Pacific. These terraces, locally called *andenes*, are the most remarkable examples of their kind known to the world, by reason of their great extent. They were irrigated by a system of canals and aqueducts, and even tunnels were cut through the mountains and channels around their sides, which may still be seen, although no longer used.

The Indians of Peru possessed two of the most valuable foods known, the potato and the manioc, the former of which they developed from an insignificant tuber no larger than a filbert, while maize was developed by cultivation from a kind of grass. When the food production of America with reference to the available plants for supporting it is considered, one cannot impute to the aboriginal race any inferiority, in ingenuity or industry, to the peoples of the Old World. The Peruvians also domesticated the only animals capable of domestication. With the exception of the dog, apparently trained to do man's bidding in nearly all parts of aboriginal America, the only animals domesticated were those of Peru, namely, the guinea-pig, used for food in Peru and Ecuador, and the more important quadrupeds—the llama, a small mountain animal useful for food and clothing, and capable to a limited degree as a beast of burden, and the alpaca, valuable for its flesh and fleece.

But the Inca, or more properly the Quichua, were not the creators of this complex of cultures, nor did they form the mass of the coast population. They had gradually worked their way from the valley of Cuzco in the mountain region, reaching the coast through the many fertile cultivated valleys, overcoming the inhabitants in a comparatively easy manner by gaining control of the water systems. This was in relatively late times, as the beginnings of their traditional history date only to three or four centuries before the arrival of white men, and during the 14th century they rapidly extended their dominion over an enormous area, certainly northward to beyond Quito in Ecuador, and southward well beyond the present Valparaiso in Chile. They were the heirs of at least four cultures, or succeeding epochs or periods of civilization, which had developed in sequence on the coast and in the great Andean valleys; in fact, although the Quichua dominated the region along the coast when the Spaniards arrived, they had made little impress on the arts and crafts of the coast people.

Pre-Inca culture

The domestication of the llama and the alpaca in the highlands (for these animals do not thrive on the coast) presupposes a long period of sedentary life by the pre-Inca people who lived in the region where this unique feature of aboriginal life was developed. Here also one should look for the development of the advanced system of social organization which apparently reached a higher stage in ancient Peru than in any other part of the Americas. This social system, called the *ayllu*, was based on an agrarian communism that gives evidence of considerable antiquity, coming into existence with the beginnings of agriculture in the region.

That man has existed for a considerable period on the Peruvian coast has been amply demonstrated by archeological explorations at a number of important sites. At Ancon, for example, superposed artificial strata show that during the earliest known period the people were a coast fisher-folk, and that in turn the place was subsequently occupied during several culture epochs before the Inca invasion. Pachacamac has yielded similar evidence of the relative antiquity of man in this region—several thousand years at least. Study of the vast number of crania from the graves affords evidence that the entire coast was first inhabited by a people of short-headed type, which evidently drifted southward along the coast and through the inter-Andean valleys. These were followed by a migration of people of the same fundamental physical type, but who practised various forms of head deformation. Later there appear groups of long-headed type, which probably reached the coast from the eastern slopes of the Andean region of Peru.

Buildings

Within the scope of this Guide it is manifestly impossible to present an adequate idea of the various features of Peruvian architecture. The people of both the coast and the interior built massive edifices of a type of construction relatively different from that of Middle America, the ruins of which may still be seen. Along the coast, where practically no stone was available for buildings or for sculpture, the structures were erected of adobes, or sun-dried bricks, now seemingly as hard as stone. Gigantic terraces and huge stepped pyramids were built for temples and burial places. Buildings were often of several stories, and, unlike those of Central America, many were provided with windows, but the roofs were always of perishable materials. Excepting the few instances of ruined coast cities whose adobe walls are ornamented with stucco designs in bas-relief, while other stucco-covered walls show traces of mural decoration, neither the exterior nor the interior walls were embellished. This is true also of the numerous stone buildings found in the ruined cities of the interior, the walls of which bear no carving. These stone houses are often characterized by their cyclopean walls, of huge stones fitted together without mortar. It is related by Spanish conquerors that many of the walls in Cuzco, the Inca capital, were covered with massive gold plates. Bonding of the masonry forming the corners of buildings was practised, a method unknown to the Middle Americans; and often copper or bronze clamps were countersunk in blocks to hold them firmly together.

The architecture of the Peruvian highlands is likewise characterized by the imposing walls of the buildings, which exhibit great skill in handling the huge polygonal blocks of stone, which necessitated vast labor and unusual skill to fit them with precision. The structures were preëminently utilitarian, yet they are impressive in the beauty of their masonry. Certainly the most excellent examples of wall construction thus far found in America are at the late Inca site of Machu Picchu; yet from the point of view of esthetic effect they do not compare favorably with the results produced by the sculptor-architects of Mexico and Central America.

Sculpture

Only two sites in ancient Peru are known where monolithic sculptures were produced to any great extent, namely, in the Andean region of Chavin, and in the neighborhood of Lake Titicaca, at the ruins of Tiahuanaco, in the present Bolivia. Stone carvings in the form of great sculptures, or as mortars, cups, and the small amulets or idols so common to Middle America, do not show the skill in workmanship developed in the northern culture areas.

It has been stated that, in the art of weaving, whether judged by the fineness of texture, the purity of design, or the harmony of color, the textile fabrics of ancient Peru are rivaled only by the most excellent products of Asia; while the technique of Peruvian fabrics, comprising as it does every method known to the primitive loom, is advanced beyond that of any other people. These fabrics range from rough cotton mats to gossamer veils, their technique from single embroidery and painting to complex gauzes and veils, and a kind of fancy weaving somewhat like Jacquard work. The Peruvians carried spinning also to the highest perfection. For textiles the fibers most commonly employed were cotton, the wool of the llama, vicuña, guanaco, and alpaca, the filaments of the agave, and occasionally human hair. The appurtenances connected with this highly esthetic industry, such as work-baskets containing spindles and yarn, and looms with partially woven fabrics, have been preserved in the graves, together with innumerable examples of every type of weave in both the unfinished and the finished products. A splendid mantle, the gift of Mr. James B. Ford, is in many respects the most beautiful example of Peruvian weaving known; it dates, however, from the first years of the Spanish dominion, as two of the motives, the double-headed eagle and the harpist, are distinctly of European derivation. This mantle, nevertheless, was woven while the Indians still possessed the skill and technique of the period in which the climax of the weaver's art was attained, hence it represents a triumph of aboriginal esthetic achievement. Textiles 354

Feathers formed an important part of the ceremonial accouterment of ancient America, and their use still

Feathered textiles 354

prevails among all the tribes to which brilliant plumage is available. Owing to the peculiarly favorable conditions for preservation in the coast deserts of Peru, more examples of feathered fabrics are known than from any other area in the New World. Ponchos, headdresses, and plumes have often been found in graves, but usually they have fallen to pieces as soon as exposed, hence well-preserved specimens of feathered textiles are among the rarest objects of Peruvian archeology. Men, animals, and geometric patterns in varying colors embellish many of these objects, and gold and silver bangles are often attached. It has been determined that the technique of interweaving the feathers of the textiles is different from that employed by the present-day Indians of South America. The Museum is fortunate to be able to exhibit several noteworthy examples of feather ponchos, the gift of Mrs. Thea Heye.

Metalwork 351 B

The ancient Peruvians were also extremely proficient in metallurgy, hence their work in gold, silver, and bronze is noted for its variety and beauty, and for the skill with which the technical processes were employed. Probably gold was more commonly used in ancient Peru than in any other part of the Americas, for a fabulous amount was obtained by the early Spaniards, all of which went to the melting-pot. Both gold and silver threads were interwoven in some of the mantles. They made ornaments, crowns with plumes and bangles, wristlets, idols, and utensils such as bowls and beakers, of the precious metal in an infinite variety of forms. A golden breast plate from Cuzco is the subject of a pamphlet issued by the Museum.

Woodcarving did not reach so high a plane as in Middle America, but elaborate ceremonial staffs were carved of wood, sometimes colored with mastic. Receptacles, paddles, clubs, and agricultural and other implements, as well as chests and idols, made of the same material, exhibit considerable skill in workmanship and design. Especially noteworthy are the elaborately carved ceremonial spades, sometimes ornamented with coverings of thin plates of gold or silver, while others bear traces of a decoration in a kind of red lacquer or in paint of other colors. Wood-working 354 A

The art of incrusting objects with mosaic was practised in the coast region of Peru, the technic being similar to that of the ancient Mexicans, though far less skill in application is shown in the Peruvian work. The materials employed were chiefly pieces of shells of different shapes, sizes, and colors, including mother-of-pearl, as well as varicolored bits of stone, turquois, and pyrites, and even ore and gold were occasionally employed. The base upon which the incrustation was laid was wood, bone, shell, or stone. Idols and large cups of wood, and other objects, were decorated with inlays of round and square bits of shell, including mother-of-pearl. Animals and birds cut out of the lips of molluscs were covered with mosaic and provided with golden studs for eyes. Mosaic ear-plugs of wood and other ornaments have been found, and bone spatulas were decorated with inlaid designs worked in turquois and pyrites. An example of mosaic-work consisting of two sections of shells embellished with turquois and shell incrustation to form a conical object, probably for ceremonial use, is displayed. Mosaic 351 A

In no other part of the world can more be learned of the life of an ancient people by a study of the pottery vessels and figures than on the coast of Peru. It is next to impossible to enumerate the countless varieties of forms and combinations of the coast pottery, for hardly two specimens are alike. Not only are found almost every combination of regular and geometric patterns, but almost the entire known cosmos contributed to the ingenious demands of the potter. Youth and age with all their external physical features, their deformations and diseases, as well as birds, animals, fishes, shells, and fruits and other vegetal products, all have their reproductions in earthenware; while architecture, the arts, daily occupations, costumes, and religious practices are likewise illustrated either by modeling or in painting, or in a combination of both, in these fragile yet almost imperishable receptacles and effigies.

Pottery
349 A F
350 A

Pottery, weaving, and metalworking flourished in Peru at the earliest period no less than in more recent times, and the art products of the earlier epoch were not inferior to those of the later. Certain types of pottery from the different culture areas are now well defined, and their chronological sequence will be definitely established as knowledge is increased by further investigation. The ceramic objects of Recuay, Trujillo, Chimbote, Chancay, Ancon, Pachacamac, and Nasca must be studied from the point of view that their development was not necessarily contemporaneous, but that they originated during long periods of time, and therefore, instead of belonging to parallel cultures, they represent succeeding epochs according as they are found

Various culture periods

in varying strata. Long-continued processes of change necessarily resulted in a great variety of forms, as may be traced through numerous types of objects. Pottery, textiles, and wrought metals exhibit fundamental differences in form and ornament, as well as in method of treatment.

CHILE

(Case 352)

THE southern part of the so-called Inca empire, named Collasuyu, comprised the region of Lake Titicaca in Bolivia, Charcas and Tucuman in Argentine, and the valleys of Arequipa, Tacna, and Moquegua in Chile. This territory of Chile was subdued by the Inca Tupac Yupanqui, shortly before the coming of the Spaniards, but the beneficent influence that was being exerted by Inca industry was destroyed in short order by the Spanish conquerors, so that little trace of this impressed culture is now found. It must not be assumed that Chile is lacking in antiquities, nor that the region is not archeologically important, because the Museum collections are restricted to one small case, for there is a paucity of material from these parts in all museums. It is not alone among the most neglected of all the highly important archeological areas in South America, but it is also a promising field for ethnological research, since there is little knowledge of the habits and customs of the Araucanians who still inhabit portions of the southern part of the country.

A neglected field

Cultures

In early times northern Chile was the seat of several cultures, chronologically considered, but the Atacameños apparently stand out as the leading people of this part of South America. The arid region from the seacoast eastward to high altitudes, reaching into northwestern Argentine and southern Bolivia, is known as the desert of Atacama. Here flourished the Atacameño culture, which was related to the Diaguita or Calchaqui culture of Argentine. Late researches in the coastal area have revealed undoubted stratified deposits which have attracted the attention of students and promise ultimately to yield much information pertaining to the ancient history of this interesting region. Owing to the extremely arid nature of the country, under conditions similar to those existing on the Peruvian coast, wood, textiles, and other materials which ordinarily perish are found abundantly and in well-preserved condition. A feature of the archeology of this region is the comparatively numerous pictographs.

Atacama objects

A small collection from ancient graves in the Atacama desert, in the province of Antofagasta, is displayed. Among the objects are a considerable number of artifacts of wood, such as the bow and short arrows, together with implements believed to have been used both in agriculture and in mining, for evidence abounds in many ancient workings that mining of copper, for which this part of Chile is now famous, was extensively conducted. Among the objects also are spade-like implements with attached handles; wooden poles with slate blades lashed at their ends by means of leather strips; weaving implements, including wooden spindle-whorls—

all are characteristic of the area. Curious spoon-like objects of wood and of bone, ladles, spatulas, and carved tubes containing thorns used in scarifying, are common both to this section of Chile and to the Diaguite region of Argentine, as likewise are small wooden boxes, curious bells or gongs, and combs with splint teeth. Basket plaques, resembling those of our Southwest, are common. Ropes of vegetal fiber and vicuña-wool, and leather thongs, are abundant. The singular wooden hooks with vicuña-wool rope tied to both ends are supposed to have been employed in lashing the cargoes to beasts of burden, like the llamas. Woven bags of vicuña-wool were carried; clothing was fashioned of cotton and wool like that found in graves of the Peruvian coast; leather sandals protected the feet from the hot desert sands. In ornaments there are strings of beads of turquois, shell, and stone. Knives and lance- and arrow-heads of chert and quartzite show high proficiency in stone-chipping. The pottery is simple in type, showing little refinement in form or decoration. There is a vast quantity of archeological material in this region, but thus far only desultory scientific work has been carried on, much of the material to be found in museums having been dug by treasure-seekers.

Araucanians

In southern Chile are found the Araucanians, whose habitat was the province, of Temuco, Mailleco, and Cautin. These Indians, the most prominent tribe in the extreme southern part of South America, resisted successfully the Inca invasion. Little of their early history is known, and of the archeology of their country practically nothing is recorded. The Museum possesses a few ancient pottery vessels from Temuco which display a local type of decoration and characteristic forms, especially the pitchers, a class of vessels that extends into Argentine. Several stone axes and club-heads, and a few personal ornaments of thin copper, such as still survive among them, end the present exhibit of Araucanian handicraft.

ARGENTINE

(Case 355)

Knowledge of the archeology of the Argentine Republic is confined chiefly to its northwestern provinces. In a region of mountains and desert plains the climatic conditions are much like those of the Atacama desert which extends well into the territory, hence wooden objects, basketry, and other usually perishable materials have been preserved to a remarkable degree, as on the Peruvian and Chilean coasts. The country has been extensively investigated in recent years by Argentine archeologists, whose researches reveal certain striking similarities in types of artifacts with those of southwestern United States. There appear to have been more than one culture in this great region, but the most generally recognized has been called Calchaqui, now more usually known as Diaguite. Of the language and affiliations of the Diaguite people nothing is known; but there is evidence of an invasion from the Andean region of Peru and Bolivia that profoundly influenced the Diaguite culture. This was in relatively modern times—at a period later than the establishment of the so-called

Tiahuanaco culture of upper Peru. As on the Peruvian coast, nearly everything buried with the dead has been preserved; but in the Museum collection there is only a small amount of material illustrating this culture area, no specimens of wood, basketry, or textiles being present. The provinces represented are Tucuman, Salta, and Catamarca.

Of interest are the large funerary urns, of a local type as to form and decoration; these are polychrome, with two handles on the body, and having broad, elongate necks, with flaring rims. Art in stone is represented by axes, and tiny, well-chipped arrowpoints. Of a great variety of copper ornaments, utensils, and implements, only a few implements are displayed. Turquois was extensively employed for necklaces and small ornaments, and spindle-whorls of stone, of a type different from those of Peru, are common. A feature of the Diaguite region is the series of small human heads and figures of earthenware, analogous to those from northern South America.

ETHNOLOGY OF MEXICO, CENTRAL AMERICA, THE WEST INDIES, AND SOUTH AMERICA

WEST HALL AND STAIRWAY HALL

MEXICO AND GUATEMALA

(Cases 303, 315 G H, 331 G, 333 A B)

The present population of Mexico and Guatemala is largely of Indian origin, and in many parts of these

The present Indians

two countries ancient customs, religious beliefs, and languages hold sway. In Guatemala alone sixteen Maya dialects are still spoken. While it is almost impossible to determine the exact proportions of pure-blood, mestizo or mixed-blood, and white, there are probably about 5,000,000 full-blood Indians and as many more mestizos. In the other republics of Middle America—Honduras, Salvador, Nicaragua, and Costa Rica—there has been an even greater admixture of white blood, hence Indian communities still speaking their aboriginal tongues may be found only in widely scattered settlements.

Languages

Tribes

Recent studies of the linguistic families of Mexico have divided them into seventeen groups, with one hundred and eighty dialects; but it is the opinion of students that linguistic research will ultimately resolve these into three mother tongues, namely, Nahua or Mexican, Otomi, and Maya-Quiche. In parts of the region where certain languages are spoken throughout wide areas, dialectal differences are found in many villages. Tribes occur as homogeneous masses in some sections of Mexico and Guatemala, while in other parts people speaking different languages are strangely intermingled. In the same settlement, separated by a single street, one may find two distinct languages, while in one Mexican town have been reported Aztec, Otomi, Tepehua, and Totonac, each preserving its independence in language, dress, customs, and beliefs, and occupying its own quarter.

Although nominally Roman Catholic in religion, the Indians of Mexico and Guatemala still retain some of their aboriginal beliefs, although they have lost much of Religion their knowledge of ancient tradition and religion. They are superstitious to a degree, believing strongly in omens, witchcraft, and divination. Among the Huichol of northern Mexico, the Mixe of Oaxaca, the Lacandon of northern Guatemala, and some of the tribes of the Maya-Quiche group of western Guatemala, is found greater adherence to primitive ideas than among other Indians of Middle America.

Throughout this Indian country native commerce is conducted much as it was before the Spanish conquest, and the periodic markets, the *tianguis*, are held weekly as in former times; merchandise is carried for great distances to annual festivals of certain saints, whose Customs modern shrines are built on the sites of aboriginal temples. The Indians are principally agriculturists, though certain native trades still prevail, such as weaving, basket- and mat-making, and the manufacture of pottery; and the products of these industries, for which certain villages are noted, are scattered over extended areas. Their mode of living, their habitations and clothing, vary according to environment, and especially altitude. They have changed but little under the influences of civilization.

Food consists mainly of corn, beans, plantains, and chile; the corn is made into cakes known as *tortillas*, Food or into a thin mush called *pozole*, which are prepared as in times before the conquest, although to a certain extent cooking-vessels of metal are now used in addition to those of the native pottery. The chief vice of the natives lies in the almost unbridled use of alcoholic stimulants, for they make many intoxicating drinks, as in former times, and indulge in them on all occasions.

Masks 303 A B

A number of specimens, especially ceremonial masks, obtained from Indians of Guatemala, are exhibited. The masks range from ancient aboriginal types to modern examples showing the influence of whites.

Drums 315 B

A wooden drum, the *teponaztli*, is displayed. Such instruments were often elaborately carved, and a few, kept from pre-Spanish times and still to be found in towns of the Mexican plateau, are brought out for use during religious festivals.

Atlatl 315 B

A spear-thrower, or atlatl, used by the Tarascan Indians of Lake Chapala, Mexico, for spearing fish, is exhibited for comparison with the two beautiful examples of the same kind of implements that have survived from ancient times.

Weaving 315 G H 333 Stairway Hall

The Museum is fortunate in possessing a fine series of blankets and zarapes from Mexico and Guatemala, the most interesting of which are from the former republic. These range from the coarse weaves of the Tarahumare and Otomi to the delicately made Saltillo zarapes, with their beautiful and dainty designs. Like the masks mentioned above, some of the weavings show distinctly aboriginal patterns, while others are plainly influenced by modern ideas. In the case of one example from Oaxaca, for instance, the Mexican eagle holds a prominent position.

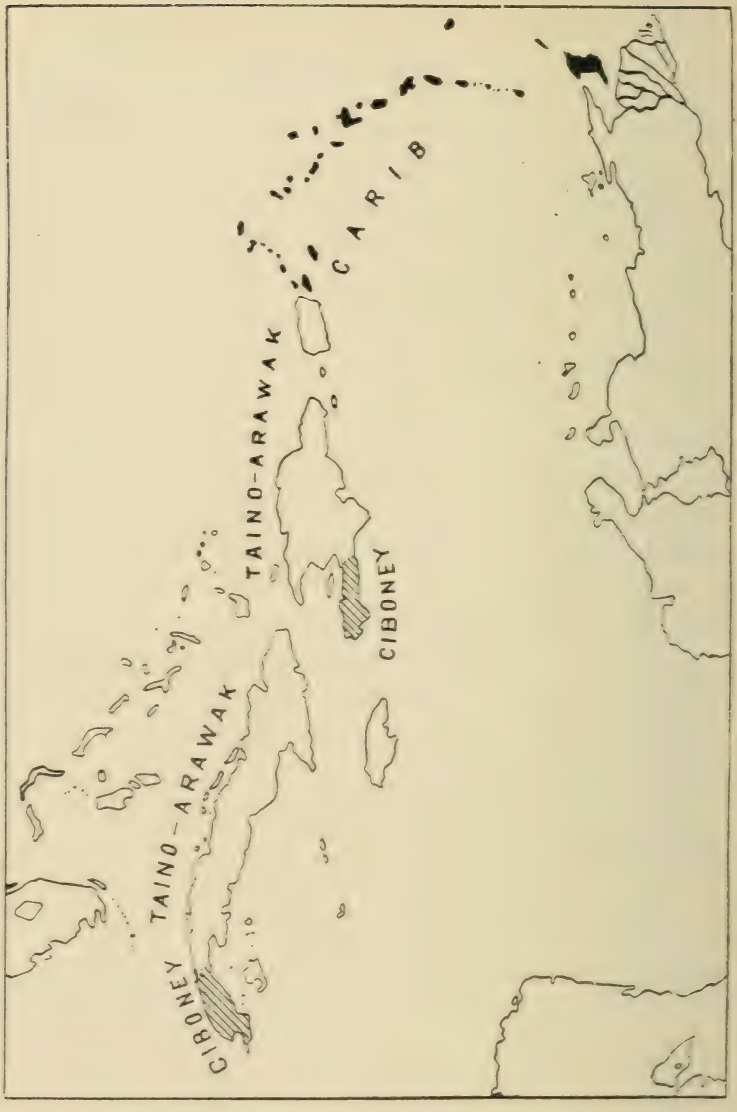
WEST INDIES

(Case 316 A, 329)

Owing to their enslavement and virtual extermination by the Spaniards shortly after the Discovery, but few persons showing Indian blood to a marked degree are left in the West Indies; yet some linger in Cuba, mostly in the eastern part, and in a few of the other islands. Most of the collection exhibited was obtained from Yara village near Baracoa, Cuba, and from scattered families in the Maisi district, survivors of the Taino. Many of the articles shown are also used by the neighboring country people of Spanish extraction, but all seem to be of aboriginal origin. Some, however, show modification due to Spanish influence. Especial attention is called to the cassava grater, made by driving bits of hard stone into a wooden tablet.

On the lower shelf may be seen a few articles made by the surviving Carib of St. Vincent and Trinidad, and on the top of Case 329 a raft or catamaran of native type from the former island.

For a summary of the aboriginal culture of the West Indies, see page 57.



DISTRIBUTION OF ABORIGINAL CULTURES IN THE WEST INDIES (ABOUT 1492)

EAST HALL

COSTA RICA AND PANAMA

Southward from Yucatan the advanced cultures of northern Middle America, as represented by the monumental ruins of the Mexican and Mayan peoples, gradually dwindle, and within the confines of Nicaragua and Costa Rica the last vestiges of their outposts are found. Here, however, commences a new and inferior type of culture, the northern extension of a phase of human life that extends well down into eastern South America, and is found in its most typical and highly developed form on the Amazon and its affluents. This culture is characterized by the use of thatched houses, usually without sides, the cultivation of maize and starchy roots to a feeble extent, the use of the blowgun with pellets and darts in hunting, and the vestigial existence of the cultivation of cotton and the textile art. In other words, there is a great decline in the material advances made by the peoples to the immediate north. Instead of having to deal with peoples who built great temples and edifices, who were expert weavers, who depended greatly on agriculture, and who had a highly organized social and political government, there are a number of far-flung savage tribes whose chief occupation is hunting, and whose government and ceremonies are primitive in the extreme.

General features

Owing to the discrepancy between the products of these natives and the archeological remains found in

Ancient and modern peoples

their present territories in Central America, the question arises whether, like the natives of Mexico and Yucatan, they are the true aboriginal peoples of the district in question, become degenerate in modern times through contact with whites, or whether they are more recent comers from the south. In all probability they are descendants of wild bands which always roamed the jungles and forests where they now are, and that their early history is somewhat obscure because they were outshone by their more brilliant neighbors, the advanced peoples, whose wealth and achievements attracted the attention of white conquerors. It is known, for example, that some of the tribes of Panama were found in a state of simple culture similar to that in which they now are, and that they took an active part as warriors and guides in the old wars between Spaniards and buccaneers. On the other hand, there is reason to believe that the Bribri of Costa Rica once enjoyed a higher state of culture, and may have been the makers of the remarkable pottery and the stone carvings of some of the districts of eastern Costa Rica, but relapsed into a hunter state after deportation to the Talamanca valley in relatively recent times.

Costa Rica

(Cases 335 J, 336)

Tribes

Beginning with Costa Rica, there are a number of tribes, most of which are found in the more remote mountainous districts. These include the Guatuso (whose ethnology is very little known and who speak a language differing wholly from that of any other tribe), the Boruca, and especially the Bribri, of Chibchan stock, from whom the Museum has a fairly complete collection and who may be considered as typical of the jungle-dwelling hunting tribes of the region.

The Bribri

Houses

The Bribri use the characteristic thatched houses of palm-leaves, before mentioned, often without sides, for ordinary dwelling purposes. In general appearance these houses resemble closely the lodges of the Seminole Indians of Florida, and the *bohios* and *caneys* of the Antilles. The chiefs, or "kings," however, have huge, conical, thatched houses, or *palenques*, reminiscent of the grass houses of the Wichita Indians of the plains of North America.

Food

Chicha

Pottery

The Bribri raise corn, sugar-cane, plantains, and a little cotton. Some families cultivate small plantations of *cacao*, the fruit of which they make into the drink called cocoa. They also have a fermented drink, *chicha*, made of corn, which is first thoroughly chewed and then fermented in large earthenware jars with pointed bases, similar in many respects to those found on the ancient sites of the Algonkian Indians of North America.

Netting

They sleep in hammocks, and are experts in netting not only these articles, but burden-bags of all sizes, although these are less attractive than the more brilliantly colored examples fashioned by the Valiante tribe of the Gulf of Chiriqui.

Stools

Unlike the Indians of North America, the Bribri and their neighbors use wooden stools, usually low and four-legged, suggestive of the *duhos* of the West

Indians, but lacking the high backs generally seen on the latter. Some of the stools are so hewn as roughly to represent tortoises. The old graves of the Atlantic highlands of Costa Rica yield many elaborate carved seats and stools of stone, usually a porous volcanic scoria, examples of which may be seen in the cases adjoining the Bribri collection. Possibly the simpler wooden seats of the latter may be degenerate survivors of these ornate stools of the past.

Domestic utensils

Among the household utensils are twilled and openwork cane baskets; calabash bowls and strainers, sometimes crudely decorated with scraped designs; dishes of folded palm-leaves, and round wooden bowls. Beaters used in shredding bark for making cloth, closely resembling the tapa-cloth pounders of Polynesia, are also employed. For grinding corn the Bribri have wooden mortars and pestles; formerly three-legged stone metates were in use, but now any smooth bowlder, even though it may lie in a public trail, is often made to suffice.

Clothing

The clothing of the modern Bribri is very simple, the men wearing a light cloth shirt and trousers made of trade material, and the women a skirt of trade or of native fabric, and sometimes a trade cloth jacket. In former times the men wore a robe and a breech-cloth of beaten-bark fabric, or a woven cotton blanket of native make. For dress or ceremonial occasions the men, and perhaps the women, still wear woven cotton belts, and the men have also headbands of cotton of native weave. The ground-color of both belts and headbands is white, prettily striped in red and blue.

For ceremonies the men use headdresses consisting of woven forehead bands of cotton, with gay plumes or down-feathers attached so as to stand in a vertical row across the forehead.

Chiefs' badges

In former times, at least, Bribri chiefs had small gold ornaments fashioned like flying eaglets, which were worn about their necks as badges of office. These eagles are identical with some of the gold ornaments found in the tombs at Las Mercedes and other localities in the eastern highlands, and may be a connecting link between the Bribri and the ancient inhabitants. The chiefs also carried carved staffs made of a hard wood called *cacique*, and usually with a crude human or animal figure at the top, which likewise were badges of their office. The Bribri in general wear necklaces ranging from the handsome examples of several strands of jaguar-teeth used by warriors, to small strings of raccoon and monkey canines which adorn the children. Strings of shell beads are common, and the chiefs have carefully wrought, large, cylindrical beads of the same material, which have the value of two cows each.

Ornaments

War and hunting implements

The weapons of the Bribri were formerly a combined digging-stick, or dibble, and warclub, shaped like a narrow paddle and made of hardwood; a long, simple bow, and compound arrow with a hardwood foreshaft and head in one piece, with many notches and barbs, but in modern examples often having a long shaft of hollow cane and metal points. Some of the arrows used in shooting fish have light multiple points of split cane. Tapir-hide shields were formerly employed in battle, it is said. Blowguns, longer by far than the height of

Blowguns

their rather diminutive owners, but generally used to propel clay balls or pellets, are used for killing small game. Possibly, in former times, at least, darts, very likely poisoned, were used with the blowguns in war.

Musical instruments

Musical instruments are represented by long goblet-shape drums of wood, carefully carved and hollowed, and covered with iguana-hide. They are beaten with the hand, not with drumsticks. A larger, cylindrical, double-headed drum is also shown. Gourd rattles, with bone handles attached to one end, but not thrust through the gourd cavity as is usual in North America, are displayed.

Transportation

For transportation, long, narrow, dugout canoes were used. A beaten-bark strap which crosses the forehead is employed in carrying burdens on the back.

Clans

Medicine-men

Like many North American tribes the Bribri are divided into two social groups, subdivided into clans having descent through the mother. Plural marriage was once common. There were three classes of shamans or medicine-men—the *usekera* or "high priest," the *tsuku* who had charge of the ceremonies in honor of the dead, and the *awa* who was a doctor or sorcerer. The custom of rendering articles taboo by casting a spell on them that none but a shaman could break, was well developed. Their divinities were a supreme being called Sibu, and several good and bad subordinate deities who quarreled over the fortunes of men, who are believed to have been born from seeds.

The ceremonies, which are few and not highly developed, were concerned chiefly with funeral rites. The *chichara* is merely a drinking bout; but a ceremony

Ceremonies

for "quenching the fire" is an all-night rite in honor of the dead, held nine days after the demise. This is characterized by a feast and the singing of ceremonial songs; a fire is lighted with a hand fire-drill, the taboo is lifted from the belongings of the deceased, and the fire is quenched.

When a Bribri is mortally ill he is carried out of his lodge to a hut especially erected to receive him, for if he dies at home the dwelling must be burned to destroy the influence of evil spirits. After his last breath, a special functionary called *oko*, who alone can handle the dead without contamination, wraps the corpse in bark blankets and plantain-leaves, bundles it in a hammock, and places it on a protected platform in the woods, where it remains for a period of five years. Then is held a ceremony known as "bone dance," when the skeleton of the deceased is taken from its scaffold and put in a permanent tomb. For a period not exceeding twenty-two days the mourners feast their friends, while sacred songs are chanted. At the end of the ceremony the guests depart; the *oko* wraps the bones in a bundle, and they are transported to a communal burial-place. Warriors were honored with a slightly different ceremony in which a masked clown exorcised evil spirits from the onlookers.

It is believed that the souls of the dead travel on a long journey to the other world, crossing dangerous rivers beset with alligators, and at last arriving in the beautiful realm of Sibu, the supreme deity.

A brochure on the ethnology of the Bribri has been published by the Museum.

PANAMA

(Cases 371 A, 372, 373 L)

Tribes

THE tribes of the Republic of Panama are represented by collections from two representative tribes, the Kuna, Cuna, or San Blas, and the Chokoi.

Kuna or San Blas

The Kuna are coast dwellers, who, owing to the treatment which they received from the Spaniards when their country was first colonized, have until very recently been bitterly hostile to Caucasians, steadfastly refusing to permit any white man to remain over night in their territory. It is also said that any native woman who mingles her blood with that of aliens is punished by death.

The original home of the Kuna extended southward from the valleys of the eastern Chagres watershed, covering both sides of the continental divide between the present Canal Zone and the bays of San Miguel and Atrato, but their range is now somewhat more restricted.

Houses

Their houses, though usually built on dry ground, are often raised on piles, especially in the rainy season, to keep their belongings dry and to protect them from the attacks of insects and reptiles. While the roofs of the dwellings are thatched with palm-leaves, the houses on the whole are superior to the hovels of the Costa Rican Bribri. Many houses are now provided with such appurtenances of civilization as sides, windows, and doors.

The two islands of Nargana, off the coast, are covered with large buildings, averaging 150 feet long by 50 feet broad, with the ridge of the roof 30 to 40 feet above the floor. Directly under the ridge extends an alley, between two ranges of high pillars which support the middle part of the structure. On each side of this passage other upright posts divide the space into square apartments, each probably occupied by a single family. The side walls are made of poles lashed together with vines, and there is a low door at each end of the structure.

The Kuna are expert seamen, and venture far from shore, in their dugout canoes, in pursuit of fish and tortoises. Excelling also in agricultural pursuits, their coast is fringed with coconut groves, and they raise large crops of plantains, corn, rice, cassava, yams, and some cacao. At the time of the blossoming of the fruit trees, of which the Kuna Indians have most of the tropical varieties, invocations are made by the shamans to propitiate the evil gods and to invite the blessings of the beneficent ones. For cacao, for example, prayers are made to a being personified in the ever-traveling sun.

Livelihood

Ceremonies

The men weave hats in the style of those of white men, and the clothing of the whites has been generally adopted. They still wear native earrings consisting of heavy gold discs, and practise facial painting to some extent. The women wear short skirts of red or blue fabric extending from hips to knees and consisting of single seamless pieces of calico rolled about the body. The torso is covered with a loose, short-sleeved blouse. Over these two garments is thrown a robe that reaches from waist to ankles.

Dress
372 A

These garments, as shown by the examples displayed, are made of colored cotton, composed of various layers of appliqué patterns neatly sewn together, producing many artistic and curious designs. Similar garments were noted among them by the explorers of two centuries ago. All the females wear gold nose-rings, and usually earrings or discs of the same metal, while their necks are laden with red, white, and blue beads, and silver coins. Animal-teeth are prized for necklaces by men and boys. Remarkable beaded armlets or cuffs are also worn, in which the beads are so carefully strung as to produce a design when wrapped about the arm or the leg, although when unwound the strings appear to be a jumble of colors. A similar technique in porcupine-quills and beads is often used to adorn ceremonial pipes among the Indians of North America. They use body paint and tattooing, and on holidays and ceremonial occasions the men wear both girdles and headdresses made of the plumes of brilliantly colored tropical birds.

Ornaments
372 A

The Kuna sometimes wear on their heads a narrow band, called by a name meaning "counter-poison," which is made of bark fiber from certain plants, with which they alone are acquainted. This band is used as a ligature in case of snake-bite, for the fibers of which it is made are supposed to have the property, real or imaginary, of healing the wound.

Weapons

For weapons the Kuna use bows and arrows, blowguns with poisoned darts, and lances.

The Chokoi are similar in many respects to the Kuna, except that, living in the interior, they are more remote from civilizing influences and consequently are more primitive. Unlike the Kuna, they are monogamists. They wear less clothing, and make abundant use of facial and body paint of annatto and soot, and tattooing, often in designs reminding one of the appliqué figures on San Blas clothing.

The Chokoi

Both the Chokoi and the Kuna have many wooden household idols, of which a series is exhibited. These bear an outward resemblance to the ancient stone idols of Costa Rica.

Household idols

The Chokoi poison their arrows with the skin secretion of a venomous tree-frog, whereas the Kuna, it is said, use the vegetal *wurale* or *curare*. Their houses, like those of the Bribri of Costa Rica, are more primitive than those of the San Blas or Kuna, and, like the latter, they use clay vessels of native manufacture to ferment their *chica*, or chewed corn intoxicant. Both Kuna and Chokoi make many handsome twilled baskets of split cane, and have an abundance of calabash utensils.

Arrow poison

Houses Utensils 371 A

Their musical instruments consist of the usual tubular drum of the Central American tribes, and gourd rattles, the latter with the handle thrust through the gourd in North American style.

Musical instruments 371 A

Both Kuna and Chokoi make excellent netted fiber carrying-bags and hammocks. Some glass-bead belts are found among them, but these are quite dissimilar in design to those of the North American tribes.

Weaving 371 A

ECUADOR

Highland People

(Case 365 C D)

Habitat and Condition

The Indians living in the great inter-Andean valleys and highlands of Ecuador, like those of similar regions in Peru and Bolivia, are largely Christianized and use the Spanish language to a considerable extent, although there are many villages in which the Quichua language of Peru is almost exclusively spoken. With the exception of geographical place-names, there exists no trace of the indigenous languages of the region before the advent of the Quichua early in the fifteenth century.

Early tribes

It is believed, however, that the present population consists of rather pure descendants of these earlier tribes, such as the Palta, Cañari, Puruha, Quillansinga, and Cara, but the submergence of their individual cultures through Quichua influence is marked. None of these tribes has been studied ethnologically, and while nominally Christians they still preserve many native traditions, folklore, and customs, among the most curious of which is the couvade.

Houses

Their dwellings are built of either adobe or stone, with thatched roofs, being adapted to the temperate and cold climates of the elevated valleys and mountain slopes. These Indians are expert in spinning and weaving, in leather-working, and pottery-making. Their chief occupations, however, are agriculture and sheep-raising.

Clothing

They clothe themselves with woolen outer garments and cotton inner ones, and wear sandals made from the fiber of the agave. Some of the primitive objects which they still use are cockle-bur wool-cards, pan-pipes of reeds, an ancient type of pins of base metal for fastening their mantles, fashioned in the same shape as the *topos* of copper, bronze, and gold, found in ancient graves. The small collection illustrating the highland people was gathered in the villages in the vicinity of Riobamba, province of Chimborazo.

Implements

ORIENTE PEOPLE

The Quichua-speaking Indians of the almost treeless highlands have little or no relation to the tribes which inhabit the forested eastern slopes of the Andes and the upper reaches of the Amazonian drainage system—the great Oriente region of Ecuador. The ethnology of these tribes is typically that of the tropical lowlands, covered with dense forests, as in the interior of Brazil and in parts of Peru, Bolivia, Colombia, Venezuela, and the Guianas—the great heart of South America. The Jivaro and Cayapa tribes, which are well represented in the Museum collections, are typical of the group.

THE JIVARO

(Cases 365 A B E F, 366)

The Jivaro Indians are composed of a group of nine closely related tribes—Huambisa, Tamora, Cuanduasi, Ashira, Andoa, Copotaza, Arapeca, Chargaime, and Upano, inhabiting the virgin forests of the rivers Pastaza, Morona, Upano-Santiago, and their affluents,

Tribes and Habitat

a district politically divided between the governments of Peru and Ecuador. The Jivaro are one of the most numerous groups of Indians in South America, numbering in all between fifteen and twenty thousand. They are also the most warlike people of the continent, and ever since 1599, when they rose against the Spaniards who had settled in their territory and virtually exterminated them, the whites have thought it best to leave them unmolested in their ancient seats.

Government

Divided among themselves, the Jivaro recognize no uniform tribal organization or common political authority, except in time of war, when a war-chief is selected with authority over all. Blood feuds and war of extermination among themselves are constantly going on, stimulated by their belief in witchcraft. Indeed warfare is the traditional and accustomed occupation of the men, and the head of an enemy is not only a trophy to a Jivaro warrior, but a fetish imbued with supernatural power. The great victory feast which follows a successful onslaught forms a part of the religious cult of the tribe. The training of boys is directed almost wholly toward making them brave and skilful warriors, and hatred of their hereditary foes is constantly taught them as a matter of virtue and practice. Youths are encouraged to follow war-parties even before they have been subjected to the ordeal that admits them to manhood.

Warfare

Although the Jivaro are polygynous, they hold their wives in high esteem, and often go to war over their abduction by enemies.

Like many South American tribes, the Jivaro are largely agricultural, and grow maize, cassava, sweet potatoes, and plantains. They also are expert hunters, and poison and trap fish and game. Livelihood

The dress of the Jivaro for ceremonial occasions is gorgeous. Lavish use of various gay-colored feathers, especially of parrots and macaws, for headdresses, is common. These often receive additional adornment in the shape of brilliant green and bronze carapaces and wing-sheaths of various tropical beetles that possess a striking iridescence as they swing in pendants or form the encrusted covering of wicker head-bands. Dress and Adornment 365 ABEF 366

For everyday use the Jivaro wear kilts and capes woven of cotton, or loose, sleeveless bark shirts, and shaggy grass rain-coats. Some kilts are made of ocelot-skin, on which are fastened seeds, porcupine-quills, and beetle-wings. The men wear long cylindrical plugs in their ears, and the women labrets of similar shape, but smaller. Women's garments are a skirt of cotton or bark, and a robe of the same material thrown over one shoulder and fastened under the arm. Necklaces made of animal-teeth, such as those of jaguars and crocodiles, and of tubular bone beads, shell plates, nuts, and bright-colored seeds, abound.

The Jivaro dwell, not in villages like other Indians of the Amazon watershed, but in communal houses occupied by several closely related families, built on the summit of a high hill or in an easily defended bend of an affluent of a larger stream so that the inhabitants are always hidden from the principal lines of travel. Houses

These communal houses are oval or circular, with close-set walls of poles and a conical thatched roof. In times of war the lodges and even the fields are fortified by a stockade, and a double wall is made for the house itself. Within the house along the inner walls are built a number of small partitions, about a yard high, also made of poles, each having a loop-hole through which the defender can shoot, should the enemy force an entry. The house has a door at each end, one for the women, the other for the men, usually consisting of half a dozen poles bound together with vines at the top, while the nether ends are free and may be separated, three on each side, making a small triangular opening through which one man at a time may squeeze. At night the poles are fastened to a transverse bar within. Even the outer wall of a fortified house has a similar door.

Defense

Before firearms were so generally used, the chiefs of the Jivaro used war towers at one end of their houses. These were four-sided, and were from 90 to 120 feet high. On the summit was a room, about 12 feet square, with walls a yard high, to protect the defenders from the lances of the enemy. The foundation of the tower was made of log pillars, and the ascent was by notched log ladders. Before the houses traps were often made by digging round holes in the ground, 4 or 5 feet deep, and large enough to receive the body of a man. At the bottom sharpened stakes were set. The pit was covered with small sticks and concealed with leaves. Another type of man-trap, set in the paths, consisted of

Towers

Man-traps

a stout sapling, bent down, and with eight wooden spikes lashed to it like the teeth of a comb. When an unwary foe followed the path and tripped on the cord which allowed the bent sapling to spring forcibly back, he was felled by the blow. Nowadays set-guns are placed in the same manner. The principal weapons of the Jivaro are the lance, and the round shield of wood or tapir-hide. Blowguns with poisoned arrows are used in hunting, but not for war.

Weapons
365 F

Household appliances consist of fire-sticks, gourd or calabash dishes and bottles (often bearing incised designs), excellently netted carrying-bags, and pottery bowls and jars which often have intricate geometrical patterns on their surfaces. They also have an abundance of neat basketry.

Household
goods
365 BEF

The Jivaro sound alarms and send messages by means of a great hollow log-drum, or *tundúy*, similar to that of the Tucano Indians of Brazil, exhibited on the central pyramid. The *tundúy* is beaten also to summon the spirits which are supposed to inhabit certain narcotic drinks taken by the Jivaro on ceremonial occasions.

Drums

The most striking feature of the Jivaro exhibit is the collection of shrunken sloth and human heads, and a shrunken human body, that of a negro, obtained from these warlike Indians. The human heads are trophies of slain enemies from some other tribe than that of those who prepared them. The method of their preparation, which varies somewhat in different localities, is as follows:

Trophies

Shrunken
heads
366 A

As soon as a Jivaro warrior has slain a foeman, he cuts off the head as close to the body as possible. After an appropriate ceremony a slit is made through the scalp from the crown downward, when the scalp and the skin of the face are carefully flayed from the skull, attached to a vine handle, and immersed for a while in boiling water, which causes the skin to contract a little. It is then set up on a stick fixed in the ground, and allowed to cool. The skull itself is discarded. The incision in the skin is now sewed with a fiber thread, and a ring made of a piece of vine is attached to the opening at the neck to hold it open. Three hot stones are first placed inside as a part of a magic rite, then it is reduced in size by filling more than half with hot sand, which is kept in motion in order that it may act uniformly on all parts of the trophy. When the sand cools, it is taken out, reheated in a broken clay pot, and returned. Each time the sand is withdrawn the scalp is scraped inside with a knife in order to remove the charred integument. As the trophy dries, the face especially is manipulated so that it retains its human features, even when greatly reduced in size.

The work of head-shrinking is commenced on the return from the scene of battle, and finished ultimately at home, where it may be kept up for several weeks, the same sand and pottery fragment being used throughout the process. At length the head is reduced to about one-fourth of its normal size, and becomes hard and dry. Three small wooden pins, painted red, are passed through the lips, and around them a fine cotton string, also colored red, is wound. This is done to prevent the slain enemy from cursing the victorious warrior. Lastly, the trophy is treated with charcoal. The heads of sloths are taken and prepared because these animals are thought to be transformed warriors of another Jivaro tribe.

Ceremonies

The ceremonies that go hand in hand with the preparation of the head, together with the subsequent rites, are elaborate and expensive, as well as tedious. Immediately on their return the victors pass through a rite of purification, followed by others at some later time, all sufficiently curious and interesting, but not possible more than to mention here. After these ceremonies the Jivaro head-taker may dispose of the head or keep it as a trophy. In recent years the demand for these heads as souvenirs has caused the Indians to extend their head-hunting activities, even to the capturing of the heads of white travelers, which also ultimately find their way to the market. Laws forbidding the practice of head-taking and shrinking have repeatedly been passed by South American countries, but they have proved to be difficult of enforcement.

Funeral rites

When a man dies he is not buried, but is left in his bed with all his belongings about him. The house and its surrounding gardens are deserted, and no one ever goes back to the house or takes anything from the fields.

THE CAYAPA

(Cases 363, 364)

Habitat

In the northwestern part of the Province of Esmeraldas is found the Cayapa tribe, which occupies the main and tributary streams of the river that bears its name, within comparatively easy reach of the ocean, which they usually visit at least once a year. These Indians number 1500 to 2000. Their material culture is well represented by the collections in the Museum.

Houses

Excessive rainfall and floods are frequent in this region, hence the Cayapa have adopted a practical type of dwelling to meet the conditions imposed by their tropical environment. The typical abodes are generally built as near as possible to the river, which affords their means of travel and contributes in other ways to their mode of life. These dwellings are pile structures, which vary in size according to the size of families. Occasionally a house is occupied communally. The floor of a house is from 4 to 12 feet above the ground, its height being very exactly gauged to escape the floods of the particular locality. The sides are left open; the roof, thatched with palm-leaves, is built steep to shed rain; and access to the dwelling is gained by means of a ladder.

Agriculture

Food

Being primarily agriculturists, the chief means of livelihood of the Cayapa is by tillage. As foods they cultivate chiefly plantains, yuca, rascadera, a few pineapples, and a little corn. Bananas are grown solely as hog feed. Cacao is cultivated for the market. Occasionally a cotton plant, either brown or white, is grown, but this is usually wild. Rubber is gathered from the jungle, and a few trees are cultivated. Their cultivated food products are augmented by various wild growths, in which the jungle abounds, as it does also in both game and fish. Maize and potatoes, cultivated long before contact with Europeans, were an important part of the Cayapa food supply when they resided in the higher Andes, but do not thrive in the low altitude and the great humidity which characterize their present home.

Distilling appliances 363 C D

Various food plants were introduced by the Spaniards, among them sugar-cane, which is now grown extensively by the Cayapa. Its chief use is for making rum, but a syrup and also a kind of preserves are produced in small quantities. The cane is crushed between the rollers of a home-made mill, from which the sap flows into a wooden trough or a small canoe. The sap is next boiled in a large pottery vessel, the froth being skimmed with calabash strainers. When the boiling produces no more froth, the syrup is regarded as cooked and is then allowed to ferment for about three weeks in large pottery vessels. The distilling is done in a crude but effective native still by a process described on the label. A special flavor is imparted to the resultant rum by adding aromatic herbs. The concoction is consumed at fiestas and during various ceremonies.

Hunting implements

In aboriginal times the blowgun was the chief hunting implement. This is a slender tube, 6 to 9 feet in length, made of palm-wood wrapped with native fiber and covered with black wax. From the blowgun are shot light palm-wood darts, about a foot in length and not much thicker than a knitting-needle. Their lightness is overcome and the darts are given force by a weight of wet clay placed near the point, and native cotton is wound as a wad about the dart near its middle to make it fit tightly in the tube. The sharp tip of the dart is charged with a virulent vegetal poison, which, when dry, will not easily rub off, but when the dart enters the game or the body of a man, death speedily ensues. A small quiver is made especially for carrying the blowgun-darts. Lances of hard palm-wood, and more recently the bow and arrow, were also used in hunting wild hogs and other large game.

War

The Cayapa were always peaceably inclined, but occasionally wars were forced upon them, on which occasions the blowgun was used as a weapon, although the lance was preferred. This weapon, 6 or 7 feet in length, is made of palm-wood, sharply pointed. The bow and arrow, the use of which is claimed to have been derived by the Cayapa from their former enemy inhabitants of the Rio Cayapas, were comparatively little used except in war.

Fishing
363 A, 364 A

The numerous streams of the region are well stocked with fish, many species of which are used as food, and are still caught by six different methods. There are three types of nets—the large set-net, the conical or casting net, and the small dip-net. These are all used to a considerable extent, especially the set-net, but the impounding trap, the pole and line, and the gig or fish-spear, are much more generally employed. Of these six devices, only the set-net, the dip-net, the trap, and the gig appear to be of aboriginal origin. All the nets are made of native fiber string, and the traps and the gig of hardwood and bamboo.

Canoes 362, 364 (top)

The rivers of the Cayapa territory provide practically the only means of travel, owing to the dense jungle. The few trails are seldom used except in hunting larger game. Certain main trails lead from the head of canoe nagivation to points in the high Andes, such as Quito. All the habitations are situated along the banks of the rivers, and to pass from one to another of these the dugout canoe is used; in fact, the canoe is one of the most prominent features in Cayapa life. Everyone begins in early childhood the training which ultimately makes him an expert canoeist.

From the important place the canoe holds in the life of the people, it is natural that the art of canoe-making should have reached a high state of perfection. Only a few species of trees furnish wood that is hard and tough enough to be suitable for the purpose. Having found a tree of the desired kind, it is felled with an axe, and the canoe is roughly fashioned from a section of its trunk. Allowed to dry and season for a month or so in the shade of the jungle, it is next hauled to the river and paddled to the home of the owner, where it is worked down and finally smoothed with adzes to the ultimate shape and finish, and is further seasoned, before being calked and painted with wax. The black beeswax is applied hot with a brush made from a coconut-husk. Sometimes along the outer surface of the gunwale are placed various designs in wax for decorative purposes. For this reason certain stamps, made of the light, soft wood of the balsa, are used. These designs, however, bear no symbolic significance.

Wax brush 364 A

Stamps 364 A

Dress 364 A B

The everyday dress of the Cayapa men consists chiefly of two garments—a very small, tight-fitting clout, and an improvised shirt of calico or of gaudily figured bandana handkerchiefs. On special occasions, such as feasts and other gatherings, a man adds necklaces of beads, buttons, and silver coins; wrist-bands and neck-bands of small white buttons; and decorations upon the face and exposed parts of the body in red, yellow, or black paint. The cloth used is woven by the women, as is the woman's skirt or manta, but all sewing is done by the men. It is said that formerly, when the Cayapa were mountaineers, they used the poncho, which at present is so common among the Indians of the interior Andean region; but on migrating into the warmer and more humid coastal region, the poncho was found uncomfortable and gave place to the present-day costume. Neither men nor women wear native footgear.

Practically the only time that babies are clothed is while they are sleeping; they are then tightly wrapped and bound with cloth, but without cradle-board or basket.

Some of the women perforate their ears and suspend from them, as ornaments, small strings of beads or other bright objects.

Hairdress Body-painting 364 B

Aboriginally both men and women wore their hair long, without braiding or other special mode of dressing, but now long hair is worn only by the women. A characteristic feature of Cayapa life is the custom of painting the face and other exposed parts of the body with vegetal pigments on special occasions. The designs, as those on various objects, are sometimes named, but no symbolic meaning is attached to them, as they are merely decorative. The paint is usually applied with the finger, but sometimes wooden stamps are used in lieu of brushes.

Domestic appliances 363, 364

The household effects of the Cayapa consist of implements and utensils of pottery, calabash, stone, and wood. The uses of all these appliances, many of which are displayed, are too numerous to mention.

Textiles 363 C, 364

Both hard and soft textiles are made in great variety. Baskets of many forms and in several different technics are made of various materials. Excellent mats and fans are manufactured from palm-fibers. Designs are sometimes produced by variations in technic, very little color being used.

Most notable are the soft textiles, woven of native cotton fibers and of the fine vicuña wool from the Andes. The beauty and intricacy of the patterns in various native colors is most remarkable, considering the crude loom upon which this work is done, and the even more simple spinning apparatus.

Wooden seats 363 A B E

The wooden benches, or seats, are of interest, because of their resemblance to the prehistoric stone seats from the province of Manabí, Ecuador, exhibited in the East Hall (see page 107).

Calabash objects 363 A F

Calabash implements and utensils are now widely used in this region, but it is said that in former times pottery was largely employed for the many purposes which various receptacles made from calabash now serve. They are used as containers for all kinds of liquids, and sometimes are perforated to adapt them for use as sieves or strainers, such as are employed in making green-corn mush and in distilling. These receptacles are commonly ornamented with incised lines or figures of mammals, birds, and human beings.

Pottery
363 A B

The Cayapa make rather crude, heavy, pottery vessels, perfectly plain except when incised lines and dots are sometimes impressed in the rim or the shoulder. The process of manufacture employed in making these vessels, with the exception of the decorating, is the same as that of some of the North American tribes, illustrated by the series displayed on the First Floor.

Religion

The primitive religion of the Cayapa consisted of a belief in a great number of spirits or powers inhabiting, with several other classes of beings, flat, square worlds of equal size. The lower world supports our world, and ours supports the upper. Beyond the edges there is nothing.

The primitive ideas of the Cayapa are now more or less mixed with introduced religious conceptions. However, a few old beliefs prevail. Among these is that of the *ku'mi,* or soul, which inhabits every human body and which has the power to leave the body during sleep, and of traveling about at will. In their travels these souls are subject to considerable danger. A shaman, for instance, may gain the confidence of one of these wandering souls, and by inducing it to drink intoxicants, insert within it some object which will work ill. On returning to the body the soul takes with it this malevolent object, which also enters the body. As a result, illness follows almost immediately, and the person dies within a short time unless properly and promptly doctored by a shaman.

Shamans' charms 364 B

After death, souls travel about as they do in sleep, frequenting burial-places and former homes. They would, if unmolested, do this indefinitely, but, owing to the danger to the living from their presence, means are taken to expel them. The shamans do this expelling by spraying the infested places with decoctions, blowing tobacco smoke, and reciting incantations.

Many of the minor spirits which they believe wander about the world can inhabit any object of unusual form. Many are benevolent, while others are always malevolent, or both, as occasion demands. Among the most important of the major spirits are thunder, lightning, various giants, cave spirits that live in the mountains, and many others that inhabit the waters of the river.

VENEZUELA

THE MACOA

(Case 371 B)

General character

The Perijá mountains forming the frontier of Venezuela and Colombia are inhabited by a large body of Indians known by the generic term Motilones; they are divided into various subtribes which take their names from the rivers whose headwaters they inhabit. The natives of this region from earliest times have resented intrusion by whites, for which reason, and because of the inhospitable character of their country, they have been little affected by civilization. The climate of their territory, in latitude 10°N., is not agreeable, for there is abundant moisture, and on account of the altitude cold and fog are so prevalent that the Indians have been called "People of the Mists." The trails to their haunts are made as obscure as possible, owing to their reluctance to have even the neighboring tribes learn of their whereabouts, and to an inherent fear of raids by Venezuelans.

The Motilone group is represented in the Museum collections by objects from the Macoa, a subtribe living on the headwaters of the Macoita, a tributary of the Apon, which may be regarded as typical of all the divisions.

Houses The Macoa houses are rectangular shelters of poles tied together with ropes made of creepers and thatched with palm-leaves obtained from lower altitudes. The settlements are widely scattered; indeed no two houses are found in close proximity.

Customs The Macoa are peculiar among the Indians of Venezuela in that the males perform the agricultural work, while the women do the weaving, which is exactly opposite to the custom among their neighbors, the Aruaco and Gajira. It is also said that their feast, birth, death, and marriage ceremonies, hunting rites, and games, are different. The Macoa are one of the few tribes of the American tropics who do not sleep in hammocks, preferring to lie upon woven grass mats.

Both men and women habitually dress in heavy robes of native cotton fabric, instead of going naked, or nearly so, by reason of the moist, cold climate of their mountain territory. Both sexes are seldom seen without an abundant use of facial paint. The men formerly wore plaited straw hats with conical crowns, surrounded by bands of highly colored toucan-feathers, examples of which, with a carrying case, are exhibited; but these hats have been superseded by cylindrical woven cotton head-bands, sometimes decorated with colored seeds. The women wear no head-dress except crowns of scarlet and black seeds, and they also affect bandoliers and necklaces of the same material.

Dress

Hats

The Macoa depend chiefly on cassava, yams, plantains, and game for their sustenance. Fire is made with hand-drills, but food is eaten when only half cooked. They have the usual intoxicating drink, *chicha*, commonly found throughout northern South America, but apparently they do not go through the customary process of masticating the material used in making the drink, in order to induce fermentation. The *chicha* is used largely to provide entertainment during a ceremony devoted to singing and drinking, when all the inhabitants of a given village, without regard to age or sex, pass into a state of debauchery.

Food

Cooking

Chicha

The Macoa women not only make various receptacles from gourds and calabashes, but they have well developed the art of basketry, manufacturing utensils of both twilled and openwork weave. Fans of the same materials and technic are also found.

Utensils

Weaving

Being excellent textile workers, they weave cotton garments on primitive looms.

Weapons

The arms of the Macoa consist of bows (which they sometimes use as quarterstaffs in fighting), and arrows with reed shafts and hardwood foreshafts attached with ornamental lashings; but blowguns are unknown, and neither lances nor warclubs are seen. Macoa boys learn archery while very young, and one of their favorite games is imitation warfare, in which they shoot at each other with arrows tipped with corn-cobs.

Musical instruments

Musical instruments are conch-shell trumpets, pan-pipes, flutes, and flageolets, but they possess neither drums nor rattles. One of the flageolets exhibited is of especial interest because of the large wax mouthpiece set at one side of the proximal end.

BRITISH GUIANA

(Cases 367–370)

Arawak and Carib

THE natives of British Guiana are of special interest because they belong principally to two great stocks, the Carib and the Arawak, offshoots from which early migrated to and settled the West Indies from northern South America. The tribes represented in the Museum's ethnological collections are the Carib, Waika, Arekuna, Akawoi, and Macusi of Carib stock, and the Atorai, Arawak, Taruma, and Wapisiana of Arawak affiliation.

Distribution

Geographically British Guiana may be regarded as consisting of three distinctive territories—the coast, the forest, and the savanna regions. The coastal district is inhabited principally by the Arawak, with here and there a Carib settlement. The forest region is occupied almost entirely by tribes of Carib origin, while the savanna country has a mixed population, being occupied by the Arekuna and Macusi, who are Carib, and the Arawak, Atorai, Wapisiana, and Taruma, together with remnants of other tribes not represented in the Museum collections. The culture of all these peoples is so intermingled that it is difficult to segregate that of any given tribe.

Houses

The houses of these Indians vary only sufficiently to meet the exigencies of environment. The natives of the coast formerly built shelters on piles over the water, such, no doubt, as those which the early Spaniards found on the shores of Venezuela and which prompted them to give the name, which signifies "Little Venice," to that country. In recent years these Indians have established their settlements farther inland, on high, dry ground. In the forest region, because of the shelter afforded by the surrounding trees, the dwellings are rectangular structures of poles supporting a thatch of palm-leaves. The two gable ends are usually open, while at the sides the thatched eaves almost touch the ground. The floor is the natural earth. Occasionally a round shelter is found among these people. The houses of the savannas, large enough to shelter several families, are almost invariably round or oval, with substantial walls of wattle and mud, often two feet thick, as a protection from the cold winds of the highlands. A short distance from the main dwelling a dome-shape structure of palm-leaves serves as a kitchen and a sleeping-place for the women, and not far off a third shelter, a mere shed, is built for the accommodation of visitors. Among the Arawak tribe a partition of palm-leaves is often provided to give a portion of the house more or less privacy.

Clothing
367 A F
368, 369

Little in the way of body covering is used by the Indians of British Guiana. The men wear a breechcloth made usually of trade materials, but occasionally it is fashioned from the beaten inner bark of a certain tree, or of cotton cloth of their own weaving. The dress of women consists of a small apron woven on a simple bow loom with artistic designs of varicolored glass beads. The enormous quantities of these beads introduced into the colony by traders are gradually supplanting the seeds and teeth once so extensively employed.

Arm and leg binding

The Arawakan Indians often bind the fleshy parts of their arms and legs with ornamental wrappings so tightly that the ligatures cut into the flesh and make their wearers appear as though deformed. This type of ornamentation was noted as being peculiar to natives of this stock wherever they were met by the early explorers, even in the islands of the West Indies.

Carib adornment

The Carib women pierce the lower lip with one or more holes, in each of which a wooden pin, point outward, is worn. The men also pierce the lower lip, from which are suspended strings decorated with pieces of red or white cotton, surmounted by a small, belt-like object of bone or shell, and to the nasal septum they suspend a crescentic ornament of metal. The men, and sometimes the women, also pierce the lobes of their ears, in which they wear a wooden pin, or a straw sometimes ornamented with hummingbird and other feathers. Face and body painting is customary, sometimes only in blotches of solid color, but often designs are worked in various hues. Necklaces, armbands, and anklets, made of a variety of colored seeds, animal-teeth, feathers, and glass beads, are worn by both men and women.

Ornaments
367A,368AB
369 C

On festive occasions the men wear elaborate head-dresses and other paraphernalia of brilliant feathers, and of iridescent beetle-wings, which tinkle with each movement of the wearer. The feathers of the head-dresses are supported by a woven basketry base. The women's dress on such occasions is less elaborate, for they wear no feathers, but adorn themselves with quantities of seeds and beads in the form of ropes around the neck, as girdles about the waist, and as armbands, wristlets, and anklets. Ornaments for children closely resemble those of the elders, except that special kinds of seeds are used.

Ceremonial dress
367 F, 368 A
369 A B E F

The principal food of the tribes of British Guiana consists of various animals and the wild fruits and roots which the country affords, supplemented by agricultural products, principally the cassava, banana, plantain, pumpkin, watermelon, yam, sweet potato, sugar-cane, pawpaws, cashews, corn, and peppers. Tobacco is raised. The fields are cleared and prepared by the men, but the women attend to the cultivation. The coast and forest people have their clearings near their

Food

houses, while on the savannas the natives are always at a considerable distance from their cultivated lands, because the ground near the houses is often stony, unshaded, and unproductive.

Cassava
367 E
369 E

Cassava is the staple among vegetal foods; the root furnishes the bread, the preparation of which is an almost continuous task for the women. After peeling, the root is reduced to a juicy pulp by scraping on a grater; this pulp is caught in a wooden trough, and then transferred to a squeezer, a tube of closely woven basketry, open at one end and there provided with a loop for suspension, and at the lower end another loop for the insertion of a pole to enable a forcible downward pressure. The basket is so woven that, when this pressure is applied, its diameter is greatly reduced, while its length is increased, hence the poisonous juice contained in the pulp is squeezed out. The dry cassava is taken from the squeezer, broken up, and sifted, so that it becomes a coarse flour, which is either wrapped in leaves and put away for future use, or is made into bread at once. Bread-making is a simple operation. Formerly a stone griddle was used, but now the iron griddle of trade is employed. The meal, which contains enough moisture to make it adhere when pressed, is spread over the hot griddle in a rather thin, circular form, and patted and shaped with a wooden fan or with a trowel-like implement of wood. After a few minutes the cake is turned over, and in a short time it is cooked, when it is placed on the roof of the house to dry.

Among the Wapisiana, Taruma, and Atorai, the cassava is more commonly used in the form of farina, which is prepared by drying the meal on a hot stone, and by constant stirring to keep it from scorching. When dry and thoroughly cooked it is stored for future use. In this state it will keep indefinitely, and may be eaten as it is or mixed with stew. Cassava bread with prolonged cooking is used for making an intoxicating drink. The bread is broken up and mixed with water in a large wooden trough. Fermentation is accelerated by mastication of the bread, an operation carried on by the women.

Other foods

The common method of preparing animal food is by stewing with peppers and salt in a large pot, which is never emptied, but more meat and peppers are added when necessary, and the stew, boiled again and again, is always ready. Many delicacies are added to the list of food staples. Birds' eggs are rarely eaten; but insects and their larvæ, and turtle- and lizard-eggs are eagerly sought, and many are smoked and dried for future use. Ants and grasshoppers, and their larvæ, are greatly relished.

Hunting
Fishing
369 F

Hunting and fishing are exclusively the men's share of the work necessary in providing animal food. Before a party of hunters start out (they never travel singly), they observe one or more ceremonies to insure success. One in particular is the use of the "nose beena," a tapering string four or five feet long, the thin end of which is passed through a nostril into the back of the throat, when the whole length of the string is drawn out through the mouth. This performance is supposed to have great efficacy. Other self-inflicted ordeals are resorted to for the same purpose.

Although the gun has been introduced, native implements are still used for securing game. Bows and several varieties of arrows are employed by the coast and forest people, while the blowgun is common among the natives of the savannas. Fish are caught in traps and nets, with hook-and-line, and with bow and arrow, and large numbers are taken by poisoning the waters of a small creek or inlet which has been dammed to form a pool. Roots, stems, and seeds of certain plants are pounded and thrown into the waters; the narcotic juices stupefy but do not kill the fish, when they are easily taken, while those left in the water ultimately recover from the stupor. Many of the arrows have poisoned points, but, like the poison placed in the waters for taking fish, these do not impair the meat for food.

Basketry
367 B E F

The men of these tribes excel in basket-making. A variety of forms is produced, each for a specific purpose. Cassava presses and sifters, bread-trays, pack-baskets, baskets for the storage of food and trinkets, fish-traps, fire-fans, and containers for blowgun darts, all show a wide range of weaves, mainly twilled, and many of the finer basketry objects are ornamented with well-executed designs. Cotton is gathered and spun by the women. A small quantity is grown and spun by almost all the Indians of British Guiana, but by far the larger part of the industry is conducted by the Arekuna, who distribute their product among other tribes. Cotton is

Fiber
367 E
69 A B E F

used mainly for the manufacture of hammocks. Fiber from the Mauritia palm, and silk grass, are likewise used for making hammocks and cordage.

Utensils
368 B
369 D

Among the household utensils may be found vessels made of gourds, calabashes, and pottery. Wooden stools are numerous. Fire-blowing fans of basketry and wood, stirring paddles for cooking, and presses for extracting the sap from sugar-cane, are common domestic appliances. Some skill is shown in woodworking, especially in fashioning weapons.

Musical
instruments
369 F

Musical instruments are represented by drums, rattles made of gourds, flutes, pan-pipes, whistles, and a stringed instrument made from the leaf-stalk of the aeta palm. For the latter a narrow strip of the outer skin is raised from the stalk, but not cut away at the ends; the strip is divided into three or four strings, with a piece of wood like a fiddle-bridge at each end. Wind blowing across the strings produces the sound. These instruments are all more or less used in connection with ceremonies and dances.

Warclubs
370 B

Particular attention is called to the survival of the stone celt-hatchet, used as a cutting blade set in an angular warclub of polished hardwood. These clubs are not only often highly ornamented with incised designs filled with white pigment and neatly bound with cotton cords or streamers, but display a variety of forms unusual in tropical America and reminiscent of the islands of the South seas. In one example the stone celt-blade is replaced by one of steel or iron, marking a transition between ancient and modern times. A pamphlet describing the warclubs, published by the Museum, treats these interesting weapons in greater detail.

DUTCH GUIANA

(Case 370 B)

Bush Negroes

A FEW specimens collected from the "Bush negroes" are exhibited. These people are not Indians, but, as their name implies, are descendants of Africans, imported at various periods between 1660 and 1840, principally by the Dutch, as slaves on sugar plantations. Their number gave them courage to resist the harsh treatment to which they were subjected, with the result that an insurrection was precipitated, followed by vigorous hostility toward the whites from about 1715 to 1775, when they won their freedom and became an independent body of such strength that, but for the help of the Carib Indians, they would have been a serious menace to the Dutch planters. The climatic conditions of the country were found to be similar in many respects to the Gold Coast of Africa. Hence today is found a colony of Bush negroes estimated to number about 7000, living a primitive life much like that of their forefathers. They inhabit the country along the Maroni, Coermolibo, and upper Cottica rivers. With the exception of their basketry, which is distinctively Carib, their artifacts show surprisingly little Carib influence. Their language is a remarkable mixture of the original African coast dialects, plus "Pidgin English," Dutch, French, and Spanish.

FRENCH GUIANA

(Case 370)

A FEW characteristic objects from the Indians of French Guiana, principally spears and warclubs with ornamental cane wrappings, are exhibited.

BRAZIL

(Cases 356 C, 359 C, 362)

The Conebo 359 C

OF the many tribes of Brazil and of the tributaries of the Amazon beyond its borders, but few specimens of their handicraft are shown. Among the Indians represented, however, are the Conebo, living in the region of the Waupes river in Brazil and Colombia, who show particular skill in pottery-making, an interesting feature of which is a kind of glaze on the surface, produced by applying copal gum to the vessel after firing, but while still hot. The painted designs in many cases show a highly conventionalized form of the human figure. The long and powerful bows of the Conebo are wrapped with cotton thread the greater part of their length, and are embellished with designs, similar to those on the pottery, painted on the wrapping. The arrows are long and usually have broad points of bamboo; these also are ornamented with painted designs.

The Tucano 359 C

The Tucano, of the same region, like other tribes of the Amazon basin, devote much time to ceremonial observances. The paraphernalia used in their dances is highly ornamented, chiefly with bright-colored feathers. A headdress and a necklace are shown on a bust. Other interesting objects employed in ceremonies are the large cigar and cigar-holder. When in use the cigar is placed between the tines of the fork-like holder and the sharpened end of the handle is thrust into the ground; the smoker then reclines at ease in his hammock, reaching out from time to time to draw in a whiff of smoke from his huge cigar.

Log-drums

On the north side of the central pyramid in the East Hall is shown a Tucano *tundúy*, or log-drum, ornamented with painted geometrical patterns in white. Drums of this type are found generally in the upper Amazon region, among many tribes, notably the Tucano, Jivaro, Zaparo, and Uitoto, by whom they are used not only in ceremonies, but for signaling, especially for sounding alarm in times of danger. It is said that under favorable weather conditions these drums may be heard for fifteen miles. The drums are suspended horizontally on two vine ropes tied to four posts planted in the ground. They are beaten with two short drumsticks, the striking ends of which are covered with crude rubber, over which is stretched a net of vegetal fiber. Some examples, like the specimen exhibited, are ornamented with conventional patterns in white, blue, or red paint, and sometimes even the supporting posts bear ornamental designs.

Putumayo River Indians 362 A B

Other objects, from the Putumayo River Indians, are the massive bows with ornamented wrappings, and circular-bladed paddles with elaborated incised designs.

The Munduruco

The region between the Tapajos and Madeira rivers is occupied by the nomadic and warlike Munduruco, who were much feared by neighboring tribes, which called them by a name signifying "decapitators," on account of the customary treatment of captives, whose heads they preserved in such manner that they retained the facial features to a large extent (see page 151). Two such heads, probably obtained from victims among the neighboring Parentintin tribe, are displayed.

Preserved heads

Caraja and Yuruna 362 A B

The Caraja and Yuruna Indians on the Xingu river, like the Munduruco, are warlike, as some of their weapons suggest. Several bone-pointed spears from the Caraja, with elaborate basketry coverings and feather ornamentation, are shown. A headdress from the Yuruna is of special interest from the fact that the crown is made from a wasp-nest surmounted with bright-colored feathers.

PARAGUAY

(Cases 359 A B D–F, 360, 361)

Tribes

THE ethnology of Paraguay is represented by objects obtained from the nomadic tribes of the Gran Chaco region, including the Chamacoco, Lengua, Tumraha, and Macikui.

Dwellings

The country of these Indians is of a forbidding nature, subject to both flood and drought, with but only brief intervals of favorable weather. The Indians congregate in small villages numbering only a few families, and each separate clan lives in its own rude shelter, or *toldo*, made of branches, roughly roofed with a thatch of grass or palm-leaves, and protected on the south or stormy side with a sunshade of reed-matting erected in front of the hovel. In these clan dwellings each family has its own apartment.

Dress
359 B E F
361 A B E F
The attire of the men is scanty. For everyday use a blanket-robe woven of cotton by the women is worn; it usually bears a pattern depicting the markings seen on snake-skins, or representing trails, palm-trees, or other natural objects. This garment is worn suspended from the waist or covering the entire body as occasion or weather demands. When hunting, the men usually wear only a fringed skin girdle and rude sandals of rawhide. Similar footgear is used by the women when gathering firewood in the forest, to protect them from the thorny undergrowth. Sandals of antbear-skin are worn in certain ceremonies. The everyday garment of the women is a skirt made of two or three skins of the goat, sheep, or small deer, sewn together, to which is added a fur mantle in cold weather.

Ornaments
Like many tribes of South America, especially those of the Amazon region, the natives of the Gran Chaco bedeck themselves with gorgeous clothing for gala and ceremonial occasions. Headdresses and girdles made of the feathers of the parrot, macaw, duck, and rhea, are worn. Belts with pendent deer-hoofs or snail-shells, girdles of human hair and seeds, and clattering pendants of antbear claws and hollow bones adorn the costume on such occasions. Necklaces of bright-colored seeds, trade glass beads, and pieces of freshwater musselshells, turtle-bones, and occasionally animal-teeth, are common.

Labrets
Large wooden button-like labrets are worn in the lower lip by the men, especially those of the Lengua tribe.

These strange ornaments cause such distention of the lip that from a distance it looks like a protruding tongue, hence the popular name *Lengua*, applied by the Spaniards. These labrets are regarded as emblems of manhood. The first insertion of the labret is accompanied by a ceremony to which strangers are not willingly admitted. When a boy is six or seven years of age his parents send for a shaman, who places the boy on his back on the ground and marks the spot where he is to operate. Then he speaks to the boy, saying, "Come! Thou hast played long enough! It is time that thou should'st become a man. Henceforth thou must work, fight, and vanquish thine enemies. Above all thou must not cry, for then thou would'st be unworthy of the labret, the badge of a man!" The shaman then pierces the boy's lip with an awl, and in the aperture a straw is inserted to keep it open; then in course of time the opening is enlarged by thrusting in successively larger and larger plugs. When a warrior is killed in battle his labret is taken as a trophy by the victor and presented by him to his wife.

Initiation into manhood

Wooden ear-plugs are also worn, chiefly by the men. They are without ornamentation, except in the case of the shamans, who embellish them with pieces of tin in the shape of stars or crosses.

Ear-plugs 361 C

The principal foods of the Gran Chaco tribes are wild beans, palm-tops, and game, which are cooked in pottery vessels. Fish is usually roasted, and meat boiled; but vegetables are never cooked with meat. Agriculture is very primitive, and its practice is limited. Wild honey is eagerly sought and collected by the

Foods

natives. For cooking food and for smoking fire is made with a wooden hand-drill.

Pipes 359 A 360 A 361 D

One of the most interesting features of the culture of the tribes of the Gran Chaco is the cultivation of tobacco (although to a limited extent), and the development of the custom of smoking. Tobacco pipes, sometimes of clay, but more commonly carved of wood, are abundant. From the Chamacoco tribesmen comes an odd specimen, long and staff-like, which served as a walking-stick as well as a pipe.

Utensils 359 D 361 C F

The domestic appliances of the Gran Chaco tribes consist of pottery vessels, the usual gourd and calabash receptacles, netted fiber carrying-bags, and animal-skins that serve as seats by day and as beds by night. From the Chamacoco there are a number of finely woven bags of native cordage, and of trade glass beads obtained from the whites. Some of the fiber bags are exceptionally well made, and are very closely woven. The pottery, found probably at its best among the Macikui, is ornamented by impressing patterns with a neatly twisted cord in the soft clay of the vessels before firing, and then filling the open areas with paint. The gourd utensils of the Macikui are incised in pleasing designs.

Fishing

Fish are generally shot with bow and arrow, but in some remote interior localities the Lengua dive in deep pools formed by weirs and capture their quarry under water with nets fastened between two long sticks. Fish-traps of twigs are set in gaps left in stone dams or weirs built across the streams during low water, and the fish are driven into them by lines of wading men.

Hunting with the bow and arrow is the common method of taking game, and the Lengua are said to be especially adept in disguising themselves with twigs and leaves so that they may approach their quarry within arrow shot. Club-like throwing-sticks are also used. For hunting small birds and animals the Tumraha use a very unusual weapon, a bow with a double string holding a pocket for hurling clay pellets. Hunting

The Tumraha Indians are also notable because of the fact that until recently there still survived among them a long wooden warclub shaped like a planting-stick, in the smaller end of which was set a narrow celt of stone; but there are examples entirely of wood, the handle and blade being carved of a single piece. Warclub

Besides the initiation into manhood, many dances and ceremonies are performed by these Indians, chief among which are thanksgiving feasts for food. Drums made of clay vessels with skins stretched across the mouths for heads, wooden whistles, and gourd rattles serve as the principal musical instruments. In some ceremonies masks impersonating bird-like demons are worn. Musical instruments 359 A 360 C D Masks

PERU

(Cases 350 A, 354 C)

A WIDE gap exists between the culture of the wild tribes of eastern Peru and the Aymara and Quichua peoples of the Andean highlands and the coast, as will be seen by comparing the modern artifacts with the ancient. The wild tribes referred to display the familiar traits of the South American jungle or forest Indians, Condition and are famous head-hunters. The latter, particularly the Quichua, represent the retrograde descendants of the builders of the great stone fortresses of the Inca, skilled workers in metals and textiles. The Aymara and Quichua, although greatly degenerated, still maintain a few attenuated ceremonies that have descended from ancient times; they still chew the leaves of cacao, like their ancestors, and possess that peculiar beast of burden, the llama, the diminutive American camel. Potatoes, one of the gifts of the Inca to civilization, still form their principal diet on the cold, windy slopes of the Andes. In early times the potato, the tomato, and quinine (once called "Peruvian bark"), were all obtained from the Indians of western Peru.

Ancient traits

Some examples of western Peruvian feather and textile work, ranging from prehistoric to early Spanish colonial times, are shown. These arts were long in vogue, and some of the later specimens, particularly the hand-woven ponchos, are exquisitely beautiful in color and design (see page 121).

Textiles and Feather-work 354 C

Some wooden cups of the early colonial period are not only ornately carved, but beautifully lacquered. Their late origin is manifest in some examples by the figures of white men on horseback, in the way that early colonial ponchos show mermaids, winged llamas, and other European or semi-European concepts; yet these cups, like the robes, are often close copies as well as direct descendants of the ancient forms.

BOLIVIA

(Cases 357, 358 B)

In the collection from Bolivia are various objects gathered from the Aymara and the Quichua. These two tribes, however, are not confined within the Bolivian borders, but extend, as before mentioned (see page 117), into Peru, Chile, and Argentine, their hamlets being found mostly in the Andean highlands. Their dwellings are built either of stone covered with adobe or of adobe bricks, with a thatch roof. Sometimes the houses are erected on posts about three feet above the ground. A fireplace of clay is provided usually in the rear part of the house; vaulted ovens are built outdoors for bread-baking, and another fireplace is provided outside where general cooking is done in fine weather. The bed consists generally of a pile of sheep and llama skins on an earthen platform in one corner of the house; and sometimes a clay bench along the rear wall is provided for lounging.

Tribes

Houses

The food supply is principally vegetal, the staple being potatoes, which are eaten fresh, frozen, or dried. Being an agricultural people they raise quantities of corn, beans, barley, wheat, and many kinds of fruits and vegetables suited to the varying altitude. They also cultivate alfalfa and other fodder for their sheep and llamas. Cotton is grown in the river valleys.

Food

Many of their cultivated areas are in a sloping country where terraced fields are necessary; these are watered by a well-understood system of irrigation. An earth-covered storehouse is built near the dwellings, where beans, corn, potatoes, and dried meats are kept for community use in case of food shortage. Being semi-Christianized, it is customary for the Indians to place a cross on top of the storehouse to keep evil spirits away.

Meat, which is used only sparingly, is supplied by the llama, vicuña, guanaco, sheep, goat, deer, chickens, and some wild birds. Fish, which also are eaten, are taken with hooks, nets, traps, and with bow and arrow. A fermented drink is made from ground corn boiled in water. Fermentation is caused by the addition, after cooking, of corn which has been chewed to a paste.

Dress
357 B
358 B

Clothing is made from native cloth of llama, sheep, or vicuña wool, and cotton. The man's costume consists of a sleeved shirt and short trousers, with a poncho for extra warmth. The shirts of the women are longer than those of the men; a blanket is wrapped around the waist as a skirt or a petticoat, and a square shawl is worn over the shoulders. Up to the age of five or six years children wear only a shirt. Sandals of leather and hats of braided straw are sometimes worn.

For adornment women wear a highly decorated spoon-shape pin of silver to fasten their shawls, and necklaces of seeds and glass beads.

The exhibited material representing the Indians of the lowlands of Bolivia in many ways resembles the objects gathered from the Indians of Brazil and the interior of Ecuador.

Wild tribes
357 A B

The Pacaguara, who live in the region between the Beni and Mamore rivers in the northern part of Bolivia, and the Chacobo who inhabit the region toward the Ucayali river across the Peruvian border, use quantities of brilliant feathers from tropical birds for headdresses and other ornaments. The use of beetle-wings and monkey-teeth for necklaces and headdresses is also prevalent among these people, as is the case with cotton and other fiber for hammocks, such as the one exhibited. They also make a cloth from the inner bark of a certain tree which often is decorated with artistic painted designs. A number of specimens of this cloth are exhibited.

Adornment
357 A B
358 B

Textiles

PATAGONIA

(Cases 358 A, Stairway Case 161 A)

Occupying the vast territory lying south of the Rio Negro of Argentine to the Straits of Magellan are a group of tribes known as the Tehuelche, Puelche, and Penck. The Puelche generally frequent the district extending from the Rio Santa Cruz to the Rio Chubut, and the Tehuelche from the Santa Cruz to the straits. They are so intermixed as to be distinguishable only by dialectic differences in language and slight difference in physique. The Penck occupy the region between the Rio Chubut and the Rio Negro; they speak an Araucanian language, and are notably different from the Puelche in physique and feature.

Tribes

Of the three tribes living in Patagonia the Tehuelche alone are represented in the Museum collections. These pampean nomads originally were strictly a foot-people, but the introduction of horses by the Spaniards in 1536 made a great change in their mode of living, because horses made transportation on the arid pampas easier and quicker. The Tehuelche are noted for their unusual

The Tehuelche

Physique

stature, many of them ranging from six feet to six feet four inches, and of proportionate build. Their breadth of chest and their muscular development have attracted the attention of travelers, and indeed they were reported to be giants by the first Europeans who met them. The Tehuelche are noted runners, and in their sports display great quickness and strength. They now almost invariably travel on horseback, but when forced to do so they can walk great distances without distress.

Dress and Adornment

The dress of the Tehuelche men consists of a waist-cloth, either of linen, blanket, or a piece of an old mantle; a robe, about six feet square, made of the skins of young or of unborn guanacos, and sometimes of skunk, fox, rhea, or wildcat. The mantle is secured about the waist by a girdle, often ornamented with silver, in which the tobacco-pouch, knife, and bolas are secured. Their feet are protected by boots made of the hocks of the horse or the puma, over which they sometimes wear overshoes made from the hock of the guanaco. They go bareheaded, their long hair being confined by a fore-head-band of yarn or of cloth. For ceremonial and other gala occasions they adorn their knife sheaths, belts, and horse gear with silver studs or plate, and wear necklaces of silver and blue glass beads.

The women wear a loose calico gown extending from shoulder to ankle, and over this a guanaco-skin mantle secured below the throat with a silver pin ornamented with a large disc. If they are very poor, a thorn serves the purpose. When traveling they also wear belts ornamented with blue glass beads or with copper or silver ornaments, and boots of horsehide similar to those worn by the men, except that the hair is left on. On state occasions they wear huge earrings and necklaces of silver and blue glass beads. Both sexes smear their faces, and occasionally their limbs, with paint made from red ocher, powdered white gypsum, and grease. The women cover their bodies with white paint at the time of marriage. Tattooing is common among both sexes.

Dwellings

The tents, or *toldos*, of the Tehuelche, designed primarily as windbreaks, are made of forty to fifty full-grown guanaco-skins sewn together and smeared with a mixture of grease and red ocher. Large square tents are used for more permanent dwellings. The covering is drawn over the frame from the rear and secured by thongs to the front poles. Curtains made of skins cleaned with flint and obsidian scrapers, fastened between the inner poles, partition the sleeping places, and the baggage, piled round the sides, excludes the cold wind.

Hunting
358 A

The introduction of the horse into Patagonia, as on the plains of North America, greatly increased the efficiency of the Indians in traveling and in procuring game, but because of their acquired taste for horse-flesh it likewise has greatly reduced the constant necessity of hunting. In aboriginal times they were dependent for food almost entirely on the chase, using the sling, the bow and arrow, the lance, and the bolas, the last a group of stone balls fastened together by thongs, for taking the guanaco and the rhea, or South American ostrich. Thrown at the legs of the game they desire to capture, the balls spread out and wind themselves about the guanaco, entangling and tripping it. Their occasional vegetal diet consisted of roots, a species of wild potato, and apples and berries when procurable.

Weaving (Stairway 161 A)

Weaving is confined to the manufacture of robes, head-bands, and garters by the women, who are also sometimes silversmiths.

Religion

The Tehuelche believe in a great good spirit gifted with much power, who made the Indians first, and also the animals necessary to their maintenance. This spirit, however, seems to take little trouble as to their welfare, consequently most of the religious observances have in view the propitiation of evil spirits, which are supposed to lurk continually outside the *toldo* and under particular rocks and rivers, watching for an opportunity to harm the people. This is prevented by the spells of the medicine-men, who are not only supposed to be gifted with the power to suppress the spirits, but who claim to be able to see them. On occasions of sickness an attempt is made to drive away the evil spirits by firing guns, throwing lighted brands into the air, and beating the backs of the *toldos* with lance-shafts or bolas. If a child hurts itself while playing, mares are slaughtered as a kind of thanksoffering that it did not die; a house is erected, and a feast and dance take place. In case of illness the doctor is sent for, and if he says the person will live, a feast is given.

Smoking

When about to smoke, the Tehuelche invariably puff toward each cardinal point, muttering an incantation. They then lie prone on the ground and inhale several whiffs which induce a state of torpor for a minute or two. A drink of water is then taken and they recover their senses completely.

On the death of a Tehuelche, his horses, dogs, and other animals are slain, and his weapons, clothing, and other belongings are placed in a heap and burned. The flesh of the horses is distributed among the relations, and the widow, who cuts her hair short in front and paints her face black, departs, bag and baggage, to the *toldo* of her relations or to that of the chief. The body is sewn in a mantle or poncho and buried in a sitting posture, facing eastward, and a cairn of stones is generally erected over the grave.

Funeral customs

TIERRA DEL FUEGO

(Case 358 A)

Occupying the territory in the vicinity and south of the Straits of Magellan, generally known as Tierra del Fuego, "Land of Fire," are found a group of tribes known as the Ona, Haush, Alaculoof, and Yahgan. Living in a desolate, sub-Antarctic region, characterized by gales and cold, and with a rainfall perhaps unequaled, these hunting Indians exhibit a simplicity in life and costume which contrasts so strongly with the culture of the Chilean and Argentine peoples that the latter seem rich by comparison. Each of the four Tierra del Fuego tribes speaks a language of its own. The Ona occupy, or have occupied, most of the mainland south of the strait, while the Haush, now almost extinct, lived on the extreme southern extremity of the mainland near Beagle channel. The Yahgan inhabit the southwest coast of the mainland and many of the numerous islands in the southernmost extremity of the archipelago.

Tribes

The Alaculoof territory extends from the western end of the strait southward as far as Brecknock peninsula and northward up the Patagonian channels.

THE LACULOOF

Less is known of the Alaculoof than of other Fuegian tribes. They have been so reduced by contact with whites that they have almost disappeared from Tierra del Fuego, with the exception of those who live in the region of Last Hope inlet, Port Grappler, Port Tamar, the vicinity of Scholl bay, Dawson island, and Beagle channel. In 1904 their number was estimated at 800. No adequate linguistic comparison has been made of their language, and many of their customs are not recorded. They are said to preserve a tradition of the existence of a stone giant which harassed them and stole their women, until he was slain by an heroic youth.

Artifacts

The Alaculoof use canoes dug out of beech logs, and are equally at home on land and water. Some of their craft, capacious enough to accommodate 20 or 30 persons, are said to be the largest of any on the South American coast. They weave fish-nets of seal sinew, and use the bow and arrow, the sling, spear, harpoon, and knife in hunting and war.

THE YAHGAN

Culturally, the Yahgan resemble the Alaculoof in general appearance, customs, and character, and many of the facts regarding Yahgan culture are applicable to the Alaculoof, although their language is different. An approximate census made more than fifty years ago placed their number as probably 2800, but, as in the case of the Alaculoof, they have been greatly reduced, so that now only about 100 survive. The low status of the culture of the Yahgan is perhaps due to their environment and isolation. Living on the seaboard, and in a sub-Antarctic climate, their staple food, with the exception of a few berries and other meager vegetal products, is derived from the sea. It is owing to the necessities of this food quest that they have developed rude but seaworthy canoes, both hollowed from logs and made of beech-bark, in which they sometimes venture considerable distances out to sea in search of stranded whales, seals, eggs, and fish. Model canoes, of both the types referred to, containing miniature weapons and other objects used by Yahgan hunters, are displayed.

Food

Deriving their livelihood chiefly from the sea, the Yahgan are what may be termed canoe nomads. Occasionally they assemble in central settlements, but threatening starvation soon scatters them about the archipelago in small family groups. They have no chiefs nor communal government, but in their community life it is customary for one to divide food or plunder equally with others.

Mode of life

Occasionally the Yahgan show deference to a medicine-man, who is supposed to have power over the elements. When a man dies, everything possible is done to efface all memory of him; all his belongings are destroyed, and his name is never mentioned. When death occurs far from home the remains are cremated, evidently to prevent their desecration by enemies or animals. In other cases the dead are interred.

Religion and death

Occasionally the Yahgan hunt whales in the open sea with spears and harpoons. Seal and otter are also taken with spears, the otter hunter often being aided by dogs. The eastern Yahgan use the bow and arrow in hunting

Hunting

the guanaco. Birds are snared, or are killed with slings or with bow and arrow.

Dwellings

The common form of shelter occupied by the Yahgan, as well as by the Ona, is a large conical wigwam, consisting of a framework of saplings or tree trunks, covered with grass, ferns, branches, bark, skins, or practically anything at hand, and provided with one or two doors. Sometimes the ground inside the shelter is scooped out, and grass and branches are spread on the floor. The fire is made in the center.

Dress

A mantle of sealskin or of sea-otter skin, or both, is the common and only garment of the Fuegian tribes. Among the Yahgan it is worn over the shoulder and chest to the waist, where it is fastened with a string.

Baskets
Bark vessels
358 A

The common form of basketry found among the Fuegian tribes is made of rush, and it is of the half-hitch coiled variety of a technic known as the "Fuegian coil." The baskets vary in size and shape, and are used for a variety of domestic purposes. Receptacles of bark, such as buckets and cups, are made also.

Ornaments

All the Fuegian tribes wear necklaces of shell and bone, and sometimes wristlets and anklets of frayed hanks of plaited sinew, often colored red. The feather crown is quite common, and fillets of plaited grass or sinew are worn, although the Yahgan men commonly use their slings as fillets.

THE ONA

While the Alaculoof and Yahgan may be classed as canoe or water tribes, the Ona are strictly a foot people, living on the mainland adjacent to the archipelago. Culturally the Ona have much in common with the Yahgan and the Alaculoof, and they also have distinctive cultural elements which they share with the Tehuelche of Patagonia, such as tattooing and the use of the child's cradle.

Dress

The Ona do not go nude, as do the other Fuegians, except when the rigor of the climate compels them to wear the skin robe. The Ona mantles, made of guanaco-skins and occasionally of fox-skins, reach to the knees or the feet, and are always worn except in hunting, wrestling, and climbing. The Ona women wear undergarments of guanaco-skin tied to the body and reaching from the breast to the knees. Their mantles are usually shorter than those of the men. In hunting and fighting the men wear a triangular peak of guanaco-skin over the forehead, so as to be less easily distinguished by game or by enemies, but the women are always bareheaded. Both men and women while traveling wear rude moccasins, and sometimes leggings, made of skin; when hunting the men paint or stain their bodies to resemble the snow or the ground over which they must advance to stalk their prey.

Bows and Arrows

The Ona still use the bow and stone-tipped arrow, but sometimes their arrows are tipped with points made from glass secured from wrecks along their storm-swept coast. Although they possess only a few other rather rude tools, their bows and arrows are beautifully finished, and they are expert marksmen.

Food

Their chief food is the flesh of the guanaco, which animal is hunted with bow and arrow. Certain vegetal and sea foods are eaten when obtainable.

When Ona boys become adolescent they are subjected to the tutelage of an experienced man for a year or two,

Ceremonies

during which time they are obliged to fast and to undergo physical tests, and the society of women is forbidden. This training is to teach them courage, endurance, and the ethics of the tribe. The men dress in masks of skin and paint themselves to represent the numerous spirits for the purpose of terrorizing the women and children to test the courage of the boy, who, if found worthy, is finally told the truth about the supposed spirits and the purpose of the masquerade, namely, to keep the women in subjection, and he is threatened with dire punishment if he should reveal the secrets to women or children. The initiation rites of the Yahgan are similar, but data on this subject, as on many others pertaining to the Fuegians, are meager.

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 39

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

SKELETAL REMAINS FROM SANTA BARBARA, CALIFORNIA

I

CRANIOLOGY

By

BRUNO OETTEKING

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
1925

THIS series of INDIAN NOTES AND MONOGRAPHS is devoted primarily to the publication of the result of studies by members of the staff of the Museum of the American Indian, Heye Foundation, and is uniform with HISPANIC NOTES AND MONOGRAPHS, published by the Hispanic Society of America, with which organization this Museum is in cordial coöperation.

A List of Publications of the Museum will be sent on request.

Museum of the American Indian,
Heye Foundation,
Broadway at 155th St.,
New York City

INDIAN NOTES AND MONOGRAPHS

EDITED BY F. W. HODGE

No. 39

A SERIES OF PUBLICATIONS RELATING TO THE AMERICAN ABORIGINES

SKELETAL REMAINS FROM SANTA BARBARA, CALIFORNIA

I

CRANIOLOGY

BY

BRUNO OETTEKING

NEW YORK
MUSEUM OF THE AMERICAN INDIAN
HEYE FOUNDATION
1925

SKELETAL REMAINS FROM SANTA BARBARA, CALIFORNIA

I
CRANIOLOGY

BY

BRUNO OETTEKING

CONTENTS

Page

Illustrations.... 6

Foreword.... 9

State of preservation and classification.... 11

The problem and the plan of its investigation.... 15

Cranial size (capacity; horizontal circumference; module). 15

Intracranial and cranio-facial correlations.... 18

Norma verticalis.... 21

Norma lateralis.... 31

Norma basilaris.... 69

Norma frontalis.... 82

Norma occipitalis.... 121

Lower jaw.... 124

Teeth.... 146

Conclusion.... 148

Literature.... 154

Index.... 159

ILLUSTRATIONS

PLATES

I. System of sagittal cranial tracings of skull B (♂)
II. System of sagittal cranial tracings of skull C (♀)
III. System of sagittal cranial tracings of skull E (♂)
IV. System of frontal cranial tracings of skull B (♂)
V. System of frontal cranial tracings of skull C (♀)
VI. System of frontal cranial tracings of skull E (♂)
VII. System of horizontal cranial tracings of skull B (♂)
VIII. System of horizontal cranial tracings of skull C (♀)
IX. System of horizontal cranial tracings of skull E (♂)
X. Median-sagittal tracing of Santa Barbara skull B (♂) in ear-eye orientation with angles marked
XI. Median-sagittal tracing of Santa Barbara skull C (♀) in ear-eye orientation with angles marked
XII. Median-sagittal tracing of Santa Barbara skull E (♂) in ear-eye orientation with angles marked
XIII. Superposition of median-sagittal outlines
XIV. Superposition of median-sagittal outlines
XV. Norma frontalis (facialis) of skull B (♂)
XVI. Norma frontalis (facialis) of skull C (♀)
XVII. Norma frontalis (facialis) of skull E (♂)
XVIII. Norma lateralis of skull B (♂)
XIX. Norma lateralis of skull C (♀)
XX. Norma lateralis of skull E (♂)
XXI. Norma verticalis of skull B (♂)
XXII. Norma verticalis of skull C (♀)
XXIII. Norma verticalis of skull E (♂)
XXIV. Norma basilaris of skull B (♂)
XXV. Norma basilaris of skull C (♀)
XXVI. Norma basilaris of skull E (♂)
XXVII. Norma occipitalis of skull B (♂)
XXVIII. Norma occipitalis of skull C (♀)
XXIX. Norma occipitalis of skull E (♂)
XXX. Norma lateralis of calotte D (♂)
XXXI. Norma verticalis of calotte D (♂)
XXXII. Norma occipitalis of calotte D (♂)

Figures

Page
1. Coronal angle of partes bregmaticæ of coronal sutures in the Santa Barbara skulls.................... 25
2. Diversity of the coronal suture in skulls from San Miguel Island, California..................... 27
3. Right and left squama temporalis of Santa Barbara B (♂).................................. 35
4. Crista supramastoidea projecting upon parietal bone. 36
5. Tracings of fossa temporalis of skull B (♂) in ear-eye orientation.................................. 38
6. Tracings of fossa temporalis of skull C (♀) in ear-eye orientation.................................. 38
7. Tracings of fossa temporalis of skull E (♂) in ear-eye orientation.................................. 39
8. Anatomical configuration and landmarks of fossa temporalis................................. 40
9. Median-sagittal frontal outlines in superposition.... 52
10. Postbregmatic elevation......................... 56
11. Schematic representation of angles at the cranial base. 64
12. Canalis hypoglossi in the Santa Barbara skulls, showing different forms of bipartition............... 73
13. Merging of the left foramen spinosum and canalis musculotubarius in skull C (♀)................. 76
14. Variation in the shape of the spina nasalis posterior of the Santa Barbara skulls.................... 77
15. Anomalous palatine perforations in skull C (♀)..... 78
16. Superposition of left frontal processus zygomatici in frontal projection............................. 85
17. Pars nasalis of frontal bone in frontal projection and ear-eye orientation with nasion and infranasion points in the Santa Barbara specimens........... 87
18. Scheme of orbital declinations of skull B (♂)........ 94
19. Scheme of orbital declinations of skull C (♀)....... 95
20. Scheme of orbital declinations of skull E (♂)....... 96
21. Midorbital outlines of nasal bones in cranial ear-eye orientation................................. 99
22. Vertical outlines of the nasal bones and angles of the nasal roof................................ 100
23. Two aspects of crista infrazygomatica............. 109

Page
24. Midfacial horizontal outlines (comparative)........ 116
25. Basal and median-sagittal outlines of chin region in the Santa Barbara mandibles in alveolar orientation........ 127
26. Lateral outlines in orthogonal projection and alveolar orientation of the Santa Barbara mandibles...... 133
27. Superposition of mandibular rami in lateral projection and alveolar orientation.................. 141

FOREWORD

LIKE many other finds of supposed antiquity in America, the much noted skeletal remains from Santa Barbara, California, have passed through the usual stages of fantastic misrepresentation in the daily press to sober evaluation by scientific judgment. The bones were found in October, 1923, by Mr. J. P. Harrington of the Bureau of American Ethnology, Washington, D. C., in the course of work conducted jointly with the Museum of the American Indian, Heye Foundation, in connection with the exploration of the Burton Mound at Santa Barbara, which was made possible by the generosity of Mrs. Thea Heye. The exploration was conducted under the immediate auspices of the Museum, by an agreement whereby the remains came to its Department of Physical Anthropology, where their methodical study was undertaken. Its procedures, so far as the craniology is concerned, are set forth in the following pages, while the results, remarks on the geological conditions and otherwise, and the discussion of the morphological significance of the find, are treated in the final chapter.

A preliminary note by the author on the Santa Barbara skeletal remains appeared in *Indian Notes*, 1924, v. I, pp. 76–83, Museum of the American Indian, Heye Foundation. He also reported on the find at the Ninety-second Meeting of the British Association for the Advancement of Science, held at Toronto in August, 1924.

BRUNO OETTEKING

SKELETAL REMAINS FROM SANTA BARBARA, CALIFORNIA

I. CRANIOLOGY

By Bruno Oetteking

STATE OF PRESERVATION AND CLASSIFICATION

THE skeletal remains from Santa Barbara as they were received during the month of February, 1924, at the Department of Physical Anthropology of the Museum, consist of three lots, named A, B, and C. The bones were heavy from the adhering soil, and incrusted with earth and ashes. After cleaning they regained their original color, which is dirty brownish for all the B items, and a lighter but uneven brownish for C. The fragments of A had absorbed ashes and remained smoke-blackened even after cleaning. The viscous consistency of the incrustation seemed to be due to a hardened and perhaps a fatty substance; however, no attempt was made to analyze it.

During the summer of 1924 two additional specimens from the same site were acquired by Mr. F. W. Hodge, then traveling in California, and sent by him to the Museum. They bore similar traces of adhering earthy material and were listed with the others as D and E, and the results of their examination are incorporated with those of the primary finds.

It deserves special mention that none of the skulls had been submitted to intentional deformation, in which respect they conform to the general status of crania from southern California. Only skull E is slightly deformed, as a result of unintentional pressure, concerning which mention is made later (pages 14, 22, 32).

In general the state of preservation is very good, except that of A, which, as already mentioned, consists of a number of fragments, and D which represents a skull cap or calotte only. The external compacta of all the parts belonging to B is so little impaired that it retains its glossy appearance. The same is true of D and partly of E. In the latter and in C the compacta is less smooth and is slightly injured in places by the chemical action of the soil and perhaps by root erosion, without, however, being scaly or calcined. Minor defects in the skulls are mentioned in connection with the parts affected in the detailed list below.

Specimens B, D, and E were quite probably males of adult age between 40 and 45 years. All the teeth, except the third lower molars of E, are erupted and worn in the way usual with North American Indians. All the sutures are open. The same applies to specimen C, quite probably a female. The fragments of A are doubtless those of a male. Frequent mention will be made of them in comparison. The five specimens are referred to in the text as either A, B, C, D, and E, or the Santa Barbara specimens, or the males (B, D, E) and the female (C), and in the tables as: A (♂), B (♂), (D ♂), E (♂), and C (♀).

The Santa Barbara cranial remains, then, comprise the following items:

A, cranial fragments of an adult male:

- *a.* frontal bone, with adhering portions of right parietal and nasal bones, and portion of right ala magna.
- *b.* right temporal bone, with incomplete squama.
- *c.* right zygomatic and maxillary bones, with adhering portions of right palatine bone, and of the palatine and alveolar processes of the left maxillary, and the horizontal process of the left palatine bone.
- *d.* right condyle of lower jaw.

Teeth:

8 7 6 5 4 3 2 1	1 x 3 x x x x x[1]
—	—

B, cranium of an adult male:
right lacrimal bone missing, left one fragmentary.

Teeth:

x 7 6 5 4 x 2 x	1 2 3 4 5 6 7 x
8 7 6 5 4 3 2 x	1 2 3 x x 6 7 8

C, cranium of an adult female:
coronal and left spheno-parietal sutures, slightly rifted after cleaning, were rejoined; as also were cracked portions of the occipital bone posteriorly of the foramen magnum; roofs of both orbits and nasal bones slightly defective;

---

[1] A cross (x) indicates loss of teeth, a dash (—) teeth not erupted, while numbers in parentheses refer to defectiveness. The latter is indicated in the same way in other bones.

anterior walls of alveoli for both upper lateral incisors and both left lower incisors open, in the latter apparently by some pathological process.

Teeth:

$$\begin{array}{c|c} 8\ 7\ 6\ 5\ 4\ 3\ 2\ 1 & x\ 2\ 3\ 4\ 5\ 6\ 7\ 8 \\ \hline 8\ 7\ 6\ 5\ 4\ 3\ 2\ 1 & 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8 \end{array}$$

D, skull cap of an adult male:

with adhering nasal bones, the upper extreme end of the left ala magna, and the interparietal portion of the occipital bone; the squamosal margin of the right parietal bone is slightly defective.

E, cranium of an adult male:

brain case slightly depressed on right side, caused perhaps by cradle-board pressure[1] or by carrying the infant on its mother's back; posterior border of foramen magnum slightly defective, also right orbital roof and both laminæ papyraceæ.

Teeth:

$$\begin{array}{c|c} 8\ 7\ 6\ x\ 4\ 3\ 2\ 1 & 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8 \\ \hline -\ 7\ 6\ 5\ 4\ 3\ 2\ x & 1\ x\ 3\ 4\ 5\ 6\ 7\ - \end{array}$$

---

[1] On this particular form of plagiocephaly, *Boas* (1889, 365) remarks: "It is a noteworthy fact that in the majority of cases the left side of the head is more prominent than the right side. Presumably this is due to the fact that the child mostly lies on his right side when in his cradle."

THE PROBLEM AND THE PLAN OF ITS INVESTIGATION

Notwithstanding the fact that on first examination the skeletal material from Santa Barbara did not appear to present any extraordinary features from the morphological angle of observation, its methodical investigation seemed to be commensurate with the importance attached to the find. This was done in such a way that in the five cranial aspects or normæ the descriptive and metrical features were subjected to a careful individual and comparative study. It is by such procedure that the significance of a given specimen might be ascertained. Furthermore, it is only by exhaustive investigation that the gradually multiplying American finds will receive the full scientific treatment due them.

The investigations were carried on with the aid of a modern instrumentarium, particularly with regard to the drawing of outlines, superimposing these, and the ascertaining of angular relations. In most of the cases the technique is that prescribed by *Rud. Martin* (1914).

CRANIAL SIZE (CAPACITY; HORIZONTAL CIRCUMFERENCE; MODULE)

In order to afford a conception of the cranial size in general, the three quantities mentioned in the heading were studied and their metrical expressions are listed in the subjoined table. On the basis of the classification of the cubic capacity of the skull as established by *Fr. and P. Sarasin*, our three skulls are euencephalic. The only pronounced difference is to be noted between the female and the males. Its capacity of 1158 ccm. places

HUMAN VARIETY	CRANIAL SIZE		
	Capacity ccm.	Horizontal circumference mm.	Module: $\frac{L+Br+H}{3}$
Santa Barbara			
B (♂)	1379	495	149.7
C (♀)	1158	478	141.0
E (♂)	1338	482	145.3
North Pacific Coast (Undeformed)			
Averages ♂	1349.5	516.4	150.2
Averages ♀	1243.8	484.5	145.6
Eskimo, Southampton Island*			
Averages ♂	1563	524	156.5
Averages ♀	1458	510	152.0
Chinese†			
Averages ♂	1456	507.4	152.7
Averages ♀	1380	492.6	147.5

* *Hrdlička* 1910.
† *Haberer* 1902.

the female skull near the lower limit of euencephaly and toward the oligencephalic class. The Santa Barbara skulls are seen to be fairly in line with the male and female averages of the North Pacific Coast. They are exceeded only slightly by the Chinese, who have just aristencephalic averages, while the Eskimo of the same column are well advanced in aristencephaly, with a male average of 1563 ccm. and a female one of 1458 ccm.

Similarly expressive are the cranial modules according to the formula $\frac{\textit{length} + \textit{height} + \textit{breadth}}{3}$. The

Santa Barbara modules fall short of all the averages contained in the third column of our table, which differ among themselves proportionally in the same way as the cubic capacities. Consulting *Hrdlička's* (1916, 118) table of cranial modules of Eastern Indians, which contains male averages of 152.2–160.4 mm., and female averages of 146.4–150.0 mm.,[1] it is seen that of our own averages the male of the North Pacific Coast does not reach even the lowest male average of that table; that in the Chinese it is level with it, and only in the Eskimo does it occupy about the middle of *Hrdlička's* range. Similar conditions obtain among the female averages, where, however, the Eskimo average of 152.0 mm. exceeds the highest Eastern Indian average of 150.0 mm. The rather low position of our own crania is furthermore confirmed by the average values of our collection from San Miguel island, where the males yielded 148.0 mm. and the females 142.3 mm. On the whole it will be realized that the cranial size of the Eastern Indians, as expressed by the cranial module, noticeably exceeds that of the Western, at least those listed in our table, while the Chinese enter the range at its lowest station and the Eskimo maintain a medial one.

The horizontal circumference also listed in our table brings out in a similar way the differences of cranial size as expressed by the other two indications. In the physiological range of that measurement, extending from 454–578 mm. (*Martin* 1914, 654), they fall quite low.

---

[1] *Hrdlička* designates centimeters; e.g., 15.22 cm.

They range likewise considerably below the averages which the same author quotes for Europeans, namely, 550 mm. for males and 520 mm. for females. The smaller size of the latter results naturally in the smaller values for all the quantitative expressions listed here.

INTRACRANIAL AND CRANIO-FACIAL CORRELATIONS

More recent craniological research has pointed to certain cranio-facial and intracranial correlations which may also briefly be referred to in our specimens. It was *Falkenburger* (1913) who, following up *Klaatsch's* (1909) discovery of the "central angle," discovered on his part the "cranio-facial" angle and the parallelism between

HUMAN VARIETY		INTRACRANIAL AND CRANIO-FACIAL CORRELATIONS		
		Angle		Angular relations between basion-nasion and bregma-lambda lines
		Central	Cranio-facial	
Santa Barbara				
B (♂)		92°	87°	−3°
C (♀)		87°	92°	+2°
E (♂)		95°	85°	−15°
Haida				
Averages	♂	91.7°	89.0°	+2.9°
		(88–97)	(86–92)	(−4 to +11)
	♀	90.4°	88.1°	+0.8°
		(90–93)	(86–91)	(−5 to +7)
Australian "K72"*		90°	90°	−8°
European†		90°	92°	−4°

*Klaatsch 1909, 18.

† Swabian; Am. Mus. Nat. Hist., 4555.

the cranial base (basion-nasion) line and the bregma-lambda chord. There are a number of other correlations, like the parallelism of the alveolar plane lines with the glabella-lambda plane as pointed out by *Klaatsch*, but only the aforementioned correlations will be discussed here. These are listed in the table on page 18.

The "central angle" is the angle which *Klaatsch* (1909) described as a rectangular correlation between the basion-bregma and glabella-lambda lines, and after the reinstitution of the latter which was *Hamy's* line of cranial orientation. This angle, ∠ glabella-intersection-bregma of pls. x–xii, oscillates around 90°. Our Santa Barbara skulls have angles of 92° in B, 87° in C, and 95° in E. This deficiency in C is probably due to the greater declination of the cranial base line, as well as to the more anterior position of the bregma. The three angles are illustrative of the variation under which they come about and which in the Haida series of our table extends from 88° to 97°, yielding averages of 91.7° in the males and 90.4° in the females. Both *Klaatsch's* Australian and the European of our table represent at 90° the ideal size of the "central angle." On the other hand, *Falkenburger's* assertion and demonstration of the recurrence, in deformed Peruvian skulls, of the correlative conditions as encountered in the normal ones, does not hold true, for instance, for the strongly deformed Chinook, whose "central angles" average 99.8° in the males and 99.2° in the females.

The cranio-facial angle is formed by the intersection of the nasion-basion and prosthion-bregma lines, i.e., ∠ nasion-intersection-bregma of pls. x–xii. This angle also oscillates around 90°, and occurs generally at that figure in varying frequencies in the different series. The deviations do not frustrate the correlation at all, but are rather in accordance with the variability of organic forms in general (*Falkenburger*, p. 94). The cranio-facial angle of the Santa Barbara skulls is like 87° in B, 92° in C, and 85° in D; in other words, it falls short of the ideal angle of 90° in B and D, and exceeds it in C. *Falkenburger* points out repeatedly his interesting observation that with increasing prognathism the cranio-facial angle also increases, an observation corroborated in the Santa Barbara skulls, and it is particularly the alveolar prognathism of C that must be held responsible for such deviation. In larger series the variation results correspondingly. The author (p. 84) gives, for instance, a range of variation for Australians of 86–96°, with an average of 90.6°. The Haida series of our table yielded averages of 89.0° and 88.1° in the sexes at a total variation of 86–92°. The two individual values of our table represent in the Australian the ideal angle of 90°, while the Swabian slightly exceeds it at 92°.

The parallelism between the nasion-basion and bregma-lambda lines also shows deviations resulting in either their anterior or posterior convergence. *Falkenburger* does not point out these possibilities, but they may be distinguished by a plus or a minus sign in the two cases. The two lines deviate in skull B at −3°, in skull C at +2°, and in E at −15°, which finds its explanation in part in the stronger declination of the nasion-basion line as expressed by the cranial base-angle of 33° in the males and 27° in the females. The two bregma-lambda lines, on the other hand, are nearly parallel, with parietal angles of 30° and 29° in specimens B and C, while an angle of 20° in D explains the stronger posterior divergence of the two lines in question. The averages of the Haida group fall on the plus side of the angle; the two individual values of the Australian and the European are found on the minus side.

Another relationship seems to obtain between the correlations described, and which are particularly noticeable in the varying figures of the Santa Barbara specimens. It is seen there that the higher "central angle" associates itself with a proportionately lower craniofacial angle and similarly a minus divergence of the basion-nasion and bregma-lambda lines, and vice versa. It appears as if these conditions represent a sort of compensatory adjustment of the varying dimensions within the cranial complex. They are not borne out, however, by the other figures of our table, but may be worthy of special study.

NORMA VERTICALIS

Following *Giuseppe Sergi's* (1893) tassonomic method of enclosing the skull contour of the vertical aspect within a geometrical or other definite outline, specimens B, C, and E are byrsoides in appearance, while D is somewhat more roundish on account of its greater frontal width. It resembles thus rather an ellipsoides or a sphenoides rotundus. The byrsoides differs from the ovoides, of which it is rather a subform, insofar as its outlines from the parietal bulgings forward are not continuously convex toward the frontal outline, but more or less concave, i.e., constricted in the temporal region. At the same time, the occipital contour is well rounded off, while the postorbital constriction is quite marked. The dotted outlines of skulls B, C, and E (pls. VII–IX), taken in ear-eye orientation at the height of the supraorbital margin, resemble thus those of a purse, as signified by the term byrsoides.[1] The outlines are amplified each by solid outlines at the height of the ear-eye plane proper. These fall entirely within the supra-orbital outlines posteriorly of the ear-frontal plane through the poria-points. In advance of it they transgress them, inclosing the zygomatic arches, bridging spacious temporal fossæ, and returning finally into the supra-orbital curve in skulls C and E, but still further exceeding it in B. This is indicative of a facial projection in the latter, which will be properly dealt with later (see page 51).

The skull C (♀) is slightly plagiocrane in consequence of a mild right parieto-occipital depression, a condition somewhat more pronounced in E (♂), and referred to on pages 12, 14, 32, 121.

The sutures, on the whole, show the typical regional differences. Of the coronal suture, the pars bregmatica is simple in the four skulls, broadly but insignificantly meandering in B, slightly serrate in the others, but somewhat obscured on account of disarticulation in C. They correspond to forms I 1 and II 2 of *Oppenheim's* (1907) scheme. The pars complicata is individually different, showing rather large excursions of lively movement in B, while those of C and D are very complicated frizzy patterns, both comparable with numbers *1* and *3* of the same author's sutures of rarely occurring designs. The pars complicata of E, on the other hand, is somewhat simpler and may be likened to form IV 6. The partes temporales of the coronal sutures, again simplifying, represent an almost exact repetition of the pars bregmatica patterns.

---

[1] *Liddell and Scott's* dictionary gives the following translation: ἡ βύρσα, the skin stripped off, a wine-skin. In a wider sense this may have referred to the similarly shaped purse which is a direct etymological derivation.

The pars bregmatica of the sagittal sutures resembles quite precisely those of the coronal sutures. The pars verticis of B is composed of long and moderately narrow loops, only slightly simplified in the pars obelica, and continued as pars postica s. lambdica similar to the pars verticis. In C they are much more in keeping with the sutural character of the pars bregmatica of both, its sagittal and coronal sutures, although of stronger, somewhat irregular dentation. Here, likewise, the pars obelica is only slightly modified as against the vertex and lambda parts. The sutural patterns of the three portions of the sagittal sutures in B and C, outside of the partes bregmaticæ, may be likened to *Oppenheim's* II 5 and II 4.

Altogether livelier is the sagittal suture of D, which indeed refers to all four divisions of the latter and which differ between themselves. Thus, while the pars bregmatica of this suture and skull conforms to scheme IV 3, the pars verticis equals I 4, the pars obelica II 4, and the pars postica s. lambdica to III 7. Similarly agitated is the sagittal suture of E, whose first two divisions may be likened to I 3 and 4, while the pars obelica is more like II 3, and the short pars postica s. lambdica like IV 6.

The discussion of the lambdoid suture, although belonging rather to the norma occipitalis, may nevertheless have its place in this connection. In all human varieties this suture is the most complicated in its partes lambdoideæ and mediæ, while the third divisions, the partes astericæ, range with the simplest of all the cranial sutures. The partes lambdoideæ of B and C are comparatively less complicated than those of D and E, the former corresponding to *Oppenheim's* sutural patterns I 4 and II 3, while the latter conforms to the very complex types III 7 and IV 8. Following in character these divisions, the partes mediæ show slight differences in type, although exceeding in complication all the other sutures. Thus, while the pars media of B assumes a form like II 6, those of C and E are like III 8 and IV 8, the latter simply continuing the pattern of its pars lambdoidea. The lambdoid suture of D is not accounted for because of the defectiveness of this skull.

The three principal cranial sutures of our skulls, showing no signs of obliteration, are neither exceedingly complicated nor very simple, and may be classed, therefore, between the Europeans as the exponents of the former, and the Chinese of the latter condition.

The partes bregmaticæ of the coronal suture are only slightly inclined toward each other, as may be seen in fig. 1. With the bregma as a vertex, they form large coronal angles of 149° in B and 152° in C, 160° in D and 150° in E. According to *Martin* (1914, 749) this angle

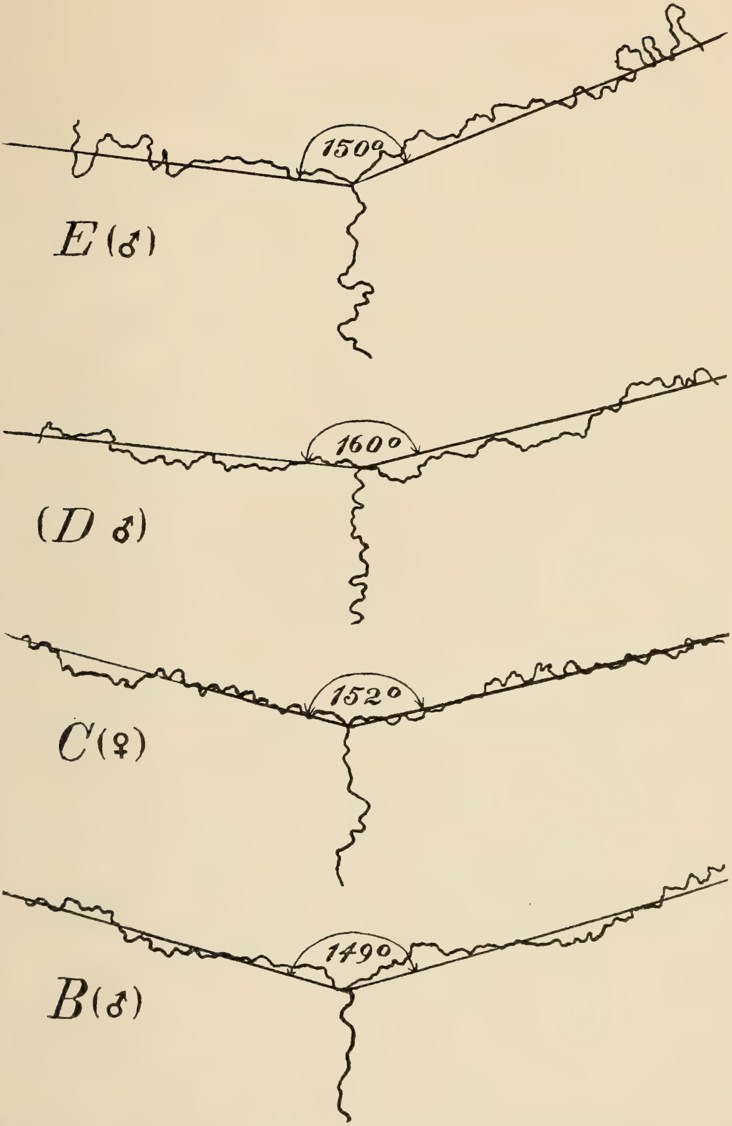


Fig. 1.—Coronal angle of partes bregmaticæ of coronal sutures in the Santa Barbara skulls

varies from 75° (Cebus) to 140° (Orang-utan) in simiidæ. It varies also in the human skull, short-headedness producing larger angles than long-headedness. Brüx, for instance, has a coronal angle of 125° only.

How variable the course of the coronal suture may be in a single series of skulls may be gained from fig. 2, *a-d*. They come from San Miguel island, California, and are contained in the collections of this Museum. In *a*, a fairly straight transverse course is to be noticed, while in *b* and *c* the two halves of the coronal suture slant forward, in *c*, however, swinging backward again and forming semicircular notches before the forward course is resumed. In *d* the great liveliness of the sutures, even of their partes bregmaticæ, is of particular interest. In illustration of what was remarked regarding the coronal angle in short- and long-headedness, it is to be stated that *a* belongs to the brachycranial variety, while *b-d* are mesocranial.

The foramina parietalia are much better developed in C than in B. While their typical number is two in the former, one on each side of the obelion portion of the sagittal suture, and at about 1 mm. in diameter, there is only one tiny foramen parietale on the left side of B. The foramina parietalia are entirely lacking in skulls D and E. It is just these two crania whose pars obelica of the sagittal suture was found to be rather complicated in contrast with the usual behavior there. This may have something to do with the absence of the foramina, suggesting a premature union of the two parietals in the obelion region of the occipital fontanelle and the suppression of the foramina. Variation as to multiple

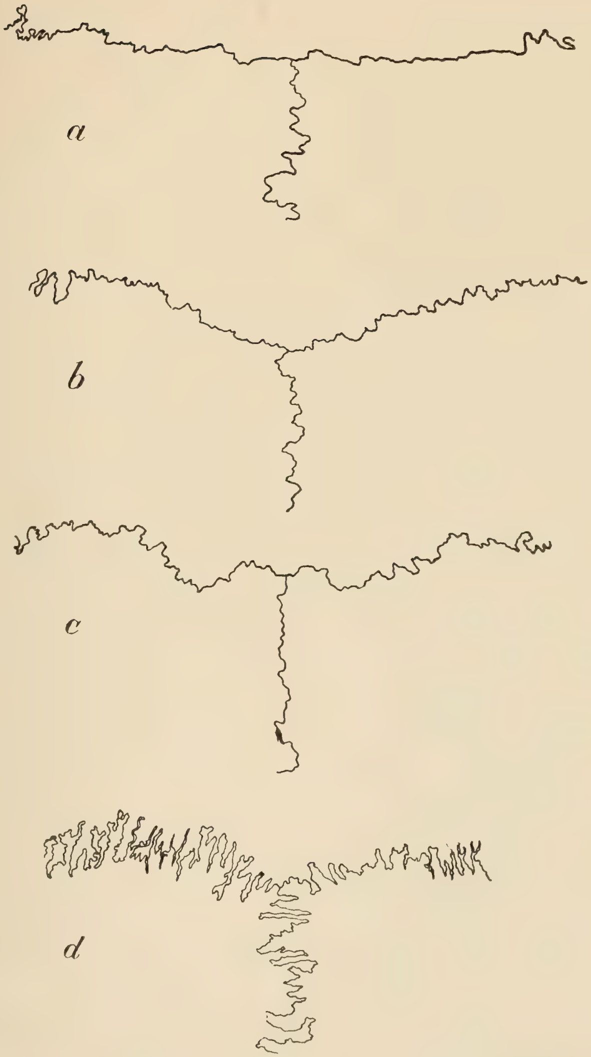


FIG. 2.—Diversity of the coronal suture in skulls from San Miguel Island, California. (M. A. I.)

or uneven occurrence is quite frequent, and total absence was noted in 19.2% in the undeformed skulls from the American North Pacific Coast.[1] *Hrdlička* (1916, 36) states that in almost half of the Lenape Indian skulls there are no parietal foramina at all.

Of the cranial dimensions observable in the norma verticalis, the length and breadth may first be discussed. The maximum length of our skulls amounts to 174 mm. in B, 167 mm. in C, 177 mm. in D, and 169 mm. in E. Within the physiological range of the cranial length measurements from a series of 84 adult skulls from San Miguel island, California, and extending from 168–193 mm. in men, our male skulls B and E occupy low stations, while D conforms exactly with the male average of 177.0 mm. The position of skull C in the female range of that series is similar to the position of B and E in the male range. Somewhat different falls the cranial breadth. Skulls B and D, with individual breadths of 141 mm. and 142 mm., hold about medium positions in the San Miguel male range of 130–151 mm., while E attains only to 134 mm. The cranial breadth of 131 mm. in the female skull C is almost in line with the lowest value of the female range of 130–140 mm. The cranial length and breadth of the Santa Barbara specimens are thus to be considered as rather submedium. The length-breadth indices computed from these figures render the two male skulls B and D brachycranial at 81.0 and 80.2, but E and the female skull C mesocranial at 79.3 and 78.4. The sex difference generally observed, of greater short-headedness of the female skull, does not obtain in our specimens; but it must be remembered that individual values only are dealt with here. Group averages of a larger number of skulls like those under discussion would quite probably be in keeping with that general condition. From the same point of view must be considered the slightly higher indices of the Santa Barbara male skulls, and the slightly lower index of the female, when compared with the San Miguel averages. Mesocrany with a tendency toward brachycrany is the character of both.

---

[1] References to craniological conditions in the Pacific Northwest here and in other parts of this monograph are from the author's studies of the Jesup Expedition skeletal material, not yet published.

The minimum frontal breadth as an expression of post-orbital constriction (*Schwalbe* 1899, 62–63) amounts to 96 mm. and 94 mm. in the male skulls B and D, and 90 mm. in the female. Conspicuously low at 85 mm. is this measurement in the male E. It ranges thus below the figures 88–92 mm. which *Nehring* (1905) quotes as characteristically low for skulls from Brazilian Sambaquis. *Hooton* (1920, 93), on the other hand, found in the Madisonville (Ohio) crania averages of 94.97 mm. and 92.71 mm. in the two sexes, but the lowest values of his ranges drop to 87 mm. in the males and to 85 mm. in the females; both ranges, however, rise to 103 mm. Compared with the average value of minimum frontal breadth in brachycranial groups (*Martin* 1914, 759), namely 99 mm., all of our four values fall below that average. But their real significance becomes manifest if brought in proportion to the parietal breadth as expressed by the transverse fronto-parietal index. This index falls with 68.1 in B, 66.2 in D, and 68.7 in C, markedly below 77, which *Martin* (1914, 759) quotes as an average for brachycrany, but coincides with *Sullivan's* (1921) Andamanese at 68.1 and 67.8 for the two sexes, whose average cranial indices are 83.4 and 81.0. Considerably below that average lies the index of skull E, namely 63.4, and that on account of its minimum frontal breadth of only 85 mm. It is thus seen that, although the absolute frontal breadth measurements of our skulls B, C, and D are not excessively low, they appear to be so in the cranial complex. Nevertheless, they fall into the metriometopic class of the transverse fronto-parietal index. Quite different, of course, is the position of skull E, whose low index of 63.4 marks it stenometopic.

There is, however, a morphological detail which, in spite of the non-excessive minimum frontal breadth, adds to the impression of pronounced postorbital constriction: the horizontal trend of the processus zygomaticus of the frontal bone, and, in consequence thereof, the obvious lateral deviation of the crista temporalis of the frontal bone. This condition will more suitably be referred to in the discussion of the norma frontalis (page 83).

As to Indian skulls with narrow foreheads, there is in our collection the full-grown skull of a Carijo Indian of the Guarani stock of southern Brazil, with even a smaller minimum frontal breadth than that listed by *Nehring* for the Sambaqui skulls, namely 85 mm., which thus corresponds with our skull E. This Carijo skull is dolichocranial at 72.6, as against the mesocranial skull E at 79.3, its transverse fronto-parietal index dropping to 66.9 as compared with 63.4 in the same Santa Barbara skull. The lower index of the latter is due to its greater parietal (maximum cranial) breadth 134 mm. to 127 mm., while both minimum frontal breadths amount to 85 mm., as mentioned above. In consequence of the pronounced postorbital constriction in conjunction with bulging zygomatic arches, the latter are phænozygous in the vertical aspect, as shown in the photographic reproductions (pls. XXI–XXIII). The cranial measurements pertaining to the norma verticalis are listed in the following table.

HUMAN VARIETY	CRANIAL MEASUREMENTS				
	length *mm.*	breadth *mm.*	minimum frontal breadth *mm.*	$\frac{\text{breadth}\cdot 100}{\text{length}}$	$\frac{\text{minimum frontal breadth}\cdot 100}{\text{cranial breadth}}$
Santa Barbara					
B (♂)........	174	141	96	81.0	68.1
C (♀)........	167	131	90	78.4	68.7
(D ♂)........	177	142	94	80.2	66.2
E (♂)........	169	134	85.	79.3	63.4
San Miguel island					
Averages ♂	177.0 (168–193)	139.7 (130–151)	—	78.3 (72.0–83.9)	—
Averages ♀	170.0 (164–175)	135.3 (130–140)	—	79.2 (77.1–83.3)	—
Carijo (Brazil) ♂	175	127	85	72.6	66.9

NORMA LATERALIS

The main impression given by the outlines of the Santa Barbara skulls in side view is in addition to an even vaulting of the brain case, the bulging development of the postauricular portion, and the protrusion of the face. The frontal outline is mildly retreating, showing the typical flexion of the human forehead by the supraglabellar depression above weakly developed superciliary ridges. The frontal outline is continued into that of the parietal, which reaches its highest point behind the bregma, more so in skulls C and E than in B. In each of the skulls the postbregmatic elevation is perfectly absorbed by the evenness of the general outline. The extreme occipital extension is reached in B, D, and E by a slight curving fall from the vertex, which is somewhat more abrupt in C. The entire occipital curve is well rounded, with almost no indication of an inial flexure in B and C, owing to a very weak development of the occipital relief, which however is slightly more marked in D. The mastoid processes pointing forward at about 45° with the plane of ear-eye orientation are well developed, and of elegant form in B and E, but rather small and insignificant in C. The elliptic pori acustici externi are rather large in the three skulls, even somewhat wider in the female, and vertically oriented. The right porus of E is slightly compressed bilaterally, very probably in consequence of the depression on that side of the cranium referred to on pages 12, 14, 22, 121. The tympanic margins are only scantily thickened inferiorly and posteriorly, excessive thickening being very frequently found in Indian skulls of the Pacific area, as is well known, and in those of the Eskimo.

Turning now to the face, it will be noticed that the nasion shows no depression whatsoever. The nasal bones protrude somewhat in their lower portions, i.e., are convex in outline, particularly in skulls B and D, while the upper form deep concavities, but no side-to-side flattening. The facial protrusion, which is quite pronounced in B and C, is augmented by alveolar prognathism in the female skull C. It differs, however, from alveolar prognathism, for intance, of the Veddah, in whom the cousins *Sarasin* pointed out the enhancement of that condition by prodenty, i.e., the strongly inclining incisor teeth. In the Santa Barbara female skull the teeth are vertically set and labidodont with those of the lower jaw. In the teeth of skulls B and C, which are fairly complete in both skulls, the plane of mastication is convexly rounded in the upper jaws, and in the fore-to-aft direction, while that of the lower jaw forms a compensatory concavity for complete occlusion of the two dental rows. Those of E do not exhibit this condition. The chins are only slightly protruding, a feature in keeping with the Mongoloid characteristics.

Muscle marks are rather weakly developed, except the temporal ones in B and E. The temporal crest of the frontal bone in the former is strong and sharp. The lineæ temporales, into which it continues in an even curve, are well marked. The upper temporal line diverges from the frontal crest about 2.5 cm. before it reaches the coronal suture, the zonula circummuscularis becoming wider and comprising the parietal bump. In a sharp turn and continuing along the lambdoid suture they terminate in the mastoid region, the zonula circummuscularis diminishing in width at the same time. The asterion region is somewhat rugged, less so the area of muscular insertion (mm. sternocleidomastoideus and splenius capitis) on the outside of the mastoids. The female skull has all these details in a less marked degree, although the mastoid outer surface is more rugged than that of the male, and in spite of much smaller mastoid processes. The cristæ supramastoideæ are well marked, although not excessively, in our specimens, and correspond more or less with the conditions generally met in Indian skulls of the Pacific Coast. The supramastoid fossæ are for that reason not very deep.

The shape of the temporal squama differs in our skulls, tending to be shorter and higher in B, and longer and lower in C and E. It is a general observation that, in connection with the former, deeper cut mastoid incisures are found, i.e., incisuræ of an angularity of 90° or less. How different, however, the conditions may be found in one and the same skull is demonstrated by fig. 3, *a* and *b*, where the two temporal squamæ of B are shown in contraposition. Of about equal height, the right squama produces a sharp-angled incisura mastoidea, while on the left side it is indicated by a shallow concavity only. The formation of an incisura mastoidea comes about occasionally by the crista supramastoidea forming a triangular ridge-like projection of the temporal squama. This temporal ridge is sometimes found continued as a parietal one upon the parietal bone, where it then terminates thinning or sickle-shape, as is the case in a mild form in skull E. Both formations are shown in fig. 4, *a*, *b*, the thorn-like one being that of a Bellacoola male (no. 4626, American Museum of Natural History), the ridge belonging to a male Haida (no. 3738, same).

The first case in particular is instructive for the reason that the low squama temporalis would very probably

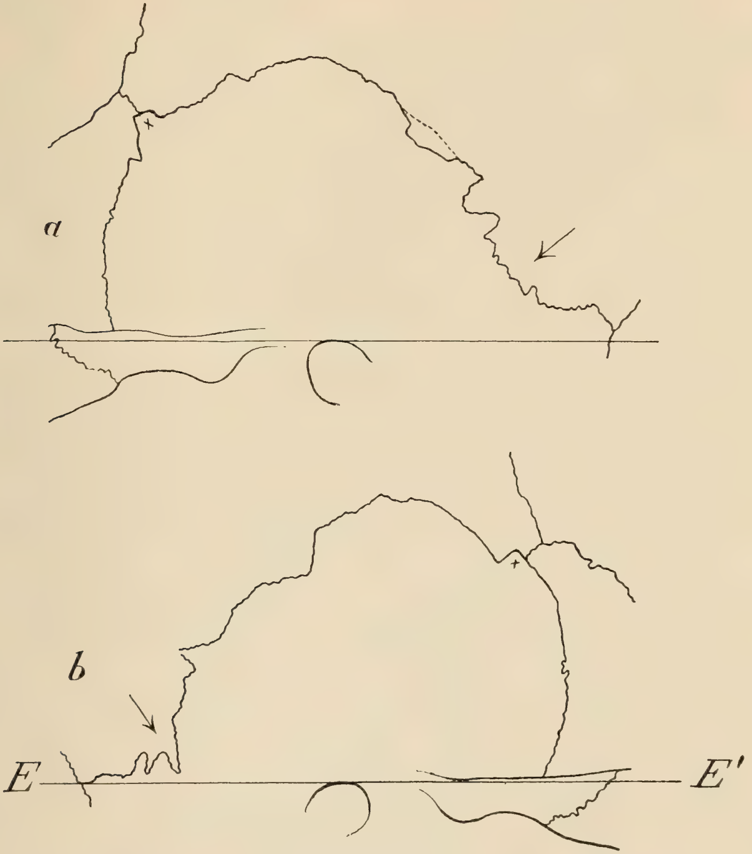


FIG. 3.—Right and left squama temporalis of Santa Barbara B (♂) to show difference of incisuræ mastoideæ (see arrows) and incipient stages of processus frontales (x). *a*, left squama; *b*, right squama; *E*—*E'*, ear-eye plane. (About $\frac{2}{3}$ natural size.)

have been without a parietal incisura were it not for the triangular projection of the supramastoid crista, the

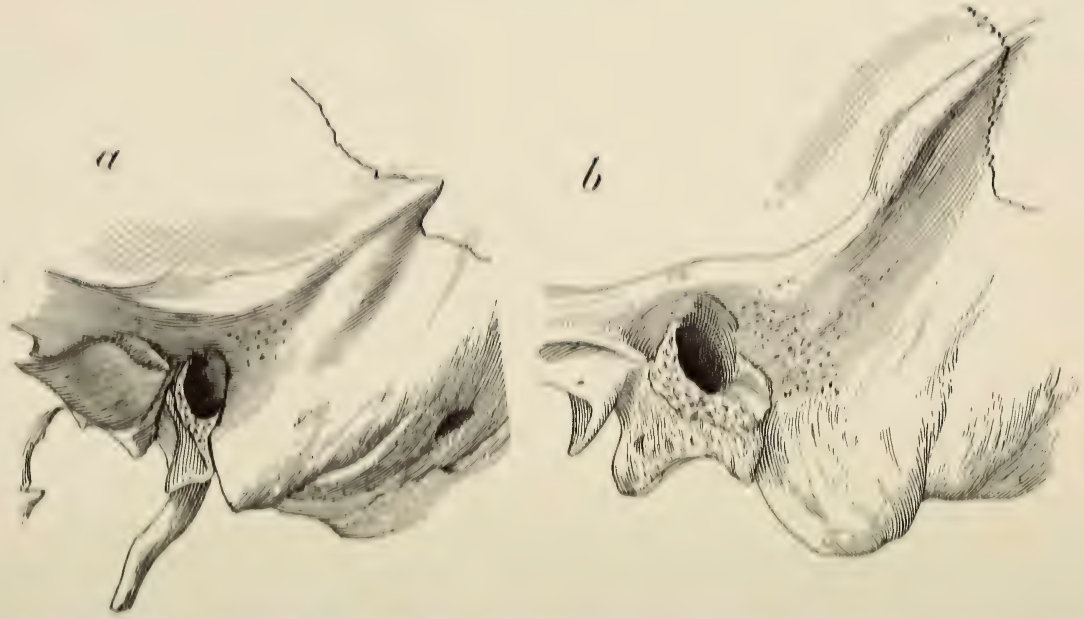


FIG. 4.—Crista supramastoidea projecting upon parietal bone. *a*, thorn-like (¾ natural size); *b*, sickle like (natural size)

latter continuing very slightly upon the parietal. Stronger parietal projections are quite frequently encountered in skulls from the Pacific Northwest, as mentioned on page 33.

The squamosal sutures are very simple, on the whole, becoming slightly livelier posteriorly. The zygomatic processes of the temporal squamæ in B and E incline very slightly and reach their maximum depression at a point above the anterior slope of the well-developed articular tubercles. From this point they rise again to continue evenly into the temporal processes of the zygomatic bones. In C the arcus are perfectly straight. Both these forms show too little significance to associate them with racial types; they occur in Europeans, Negroes, and Mongoloids.

The temporal squamæ of B are markedly bulged laterally, signifying a better development of the temporal lobes of the brain as compared with more plane surfaces of the squamæ in C and E. The sulcus sphenoparietalis (*Schwalbe*), indicative on the cranial outside of the dividing furrow of the fronto-parietal and temporal lobes of the brain (*fissura Sylvii*), is therefore somewhat more distinct in the male skull B.

The fossæ temporales are spacious transversely, as well as longitudinally, especially in the female skull. Here and in E this state is recognizable by the greater length of the spheno-parietal suture and the greater width of the ala magna. In skull B, on the other hand, the temporal squama extends farther forward into the fossa temporalis, thus shortening the length of the latter. For a better understanding of the size and depth of the tem-

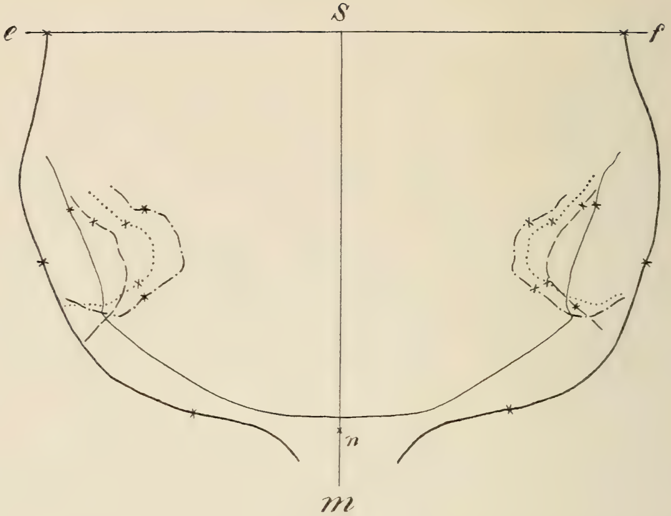


FIG. 5.—Tracings of fossa temporalis of skull B (♂) in ear-eye orientation, on a level with: ━━━━ ear-eye plane; ———— minimum frontal breadth; ‐ ‐ ‐ ‐ ‐ zygomatico-frontal suture; . . . . ektokonchion; —.—.— crista infratemporalis. *e—f*, ear-frontal; *m—s*, median sagittal plane. (½ natural size.)

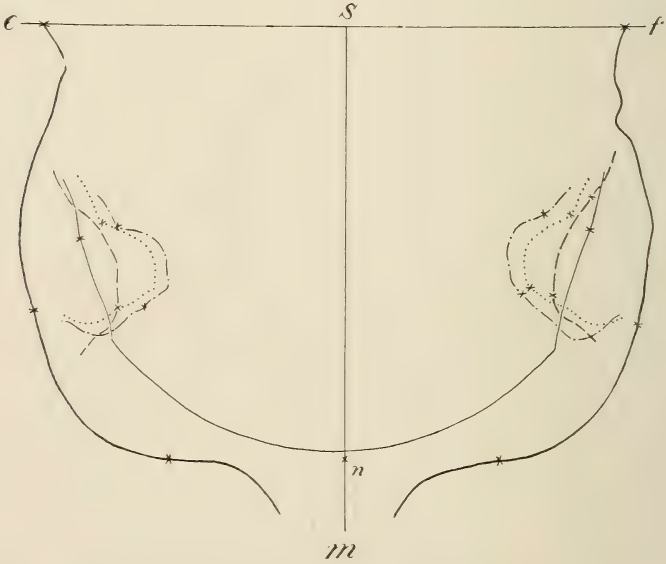


FIG. 6.—Tracings of fossa temporalis of skull C (♀) in ear-eye orientation. Levels and markings as in fig. 5. (½ natural size)

poral fossæ of our three skulls, their outlines have been traced at different levels as shown in figs. 5–7. Enclosed in a facial curve coinciding with the ear-eye plane, the temporal fossæ have been traced at the four different levels of the minimum frontal breadth, the zygomatico-frontal suture, the ektokonchion, and the crista infra-

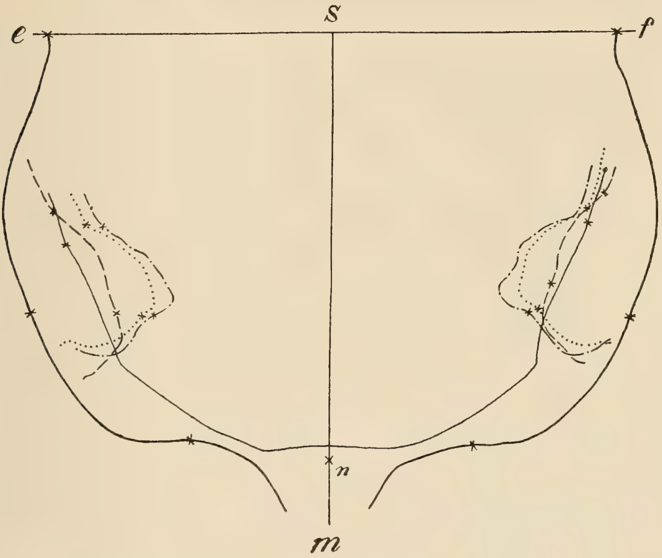


FIG. 7.—Tracings of fossa temporalis of skull E (♂) in ear-eye orientation Levels and markings as in fig. 5. (½ natural size)

temporalis. The latter illustrates in every case the greatest depth of the temporal fossæ, which gradually diminishes upward. The curve systems are supplemented by the next table of measurements. It gives the length of the fossa temporalis as taken between the deepest point of the notch of the zygomatic process of the temporal bone, and the sutura zygomaticomaxillaris on its temporal course, and at half the corpus height of the zygomatic bone; the width of the temporal fossa as measured between the crista infratemporalis[1] and the temporal surface of the zygomatic arch, parallel with the frontal plane; the index derived from these two measurements; the length of the sphenoparietal suture between the krotaphion and sphenion measuring points; the combined lengths of the sphenoparietal and sphenofrontal sutures, directly between the krotaphion and sphenofrontale (mihi; the point of meeting of the sphenofrontal and sphenozygomatic sutures); the projective distance between the krotaphion and frontotemporale, the latter indicating on the crista temporalis of the frontal bone the point of greatest frontal constriction. The anatomical configuration in the fossa temporalis and the landmarks are illustrated in fig. 8.

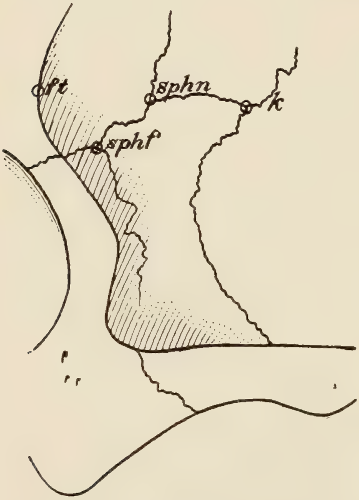


FIG. 8.—Anatomical configuration and landmarks of fossa temporalis. *ft*, frontotemporale; *sphf*, sphenofrontale; *sphn*, sphenion; *k*, krotaphion.

The table, with a few additions, lists only the Santa Barbara data and may be used as a model for future comparative study.

---

[1] The tuberculum spinosum of the crista infratemporalis may be recommended as a measuring point, if not so bulky as to modify the true width of the temporal fossa.

HUMAN VARIETY	FOSSA TEMPORALIS*											
	length		width		width · 100 / length		Krotaphion-sphenion†		Krotaphion-sphenofrontale		Krotaphion-frontotemporale	
	r	l	r	l	r	l	r	l	r	l	r	l
Santa Barbara	*											
B (♂)	38	38	30	28	78.9	73.7	4	7	28	28	31	31
C (♀)	42	40	30	30	71.4	75.0	14	16	33	34	37	42
E (♂)	41	42	28	29	68.3	69.0	14	16	37	38	41	44
Eskimo‡ ♂	—	—	29		—	—	—	—	—	—	—	—
Eskimo‡ ♀	—	—	27		—	—	—	—	—	—	—	—
Europeans‡	—	—	25.5		—	—	—	—	—	—	—	—

* The measurements are in millimeters.
† For explanations see text immediately preceding.
‡ *Cameron* 1923, p.c. 39.

The difference of dimension between the two sides of the skull is the rule in the listings of this table. The length-width index of the fossa temporalis is more influenced by its variable length than by its width, which is more stable. The male width is quite in keeping with *Cameron's* figure for Eskimo, while his female Eskimo range below the female Santa Barbara skull. The Europeans have a width of only 25.5 mm.; it must be taken in consideration, however, that the zygomatic bridge, which is involved in this measurement, represents a racially differing feature. Coinciding with the low indices of our skull E (♂) are seen the high sutural lengths as compared with those of B (♂) and C (♀), a fact already referred to.

Additional mention should be made regarding the sphenoparietal suture of skull B. Approaching the stenocrotaphic state[1] with a length of only 4 mm., the left suture takes a strong upward turn. The krotaphion is situated on the summit of a trapezoid projection of the temporal squama, denoting an incipient stage of the processus frontalis.

This condition is prompted on the right side of skull B by a sharp rectangular forward turn of the squamosal suture, which latter is evenly continued into the sphenosquamosal suture. Fig. 3, *a*, *b*, depict these slightly irregular appearances.

The shape of the processus frontosphenoidalis is rather slender and high in our three skulls, with marginal processes hardly indicated. In the fragments of skull A, however, the frontosphenoidal process is somewhat more robust, and the marginal one well developed. The height of the processus frontosphenoidalis in our skulls is influenced by the more horizontally directed zygomatic processes of the frontal bone, particularly in skull B. The bearing of this condition on the production and extent of postorbital constriction is referred to on page 30 and will be further discussed on page 83. In a previous publication (*Oetteking* 1919) racial differences prevailing in this region as concerns the shape and lateral recession of the process under discussion have been pointed out. It was shown there that among European, Eskimo, and Negro, the first named held a medium position as regards the recession of the processus frontosphenoidalis. Measured in lateral projection between the medial and lateral borders of the left orbit (maxillofrontale-ektokonchion), the greatest distance amounted to 9 mm. in the Eskimo, 13 mm. in the European, and 16 mm. in the Negro. Our three skulls, with 14 mm. in B, and 12 mm. each in C and E, thus conform with medium conditions as represented by Europeans. The orbital measurements in general are treated on pages 91, 98.

---

[1] A stenocrotaphic state is reached with a length of 3–0 mm. of the sutura sphenoparietalis (*R. Virchow* 1875, 52). *Lange* (1924, 373) has found that the greatest absolute length of the suture occurs in Europeans; it is less extended in the Negroes, and shortest in the Australians. Stenocrotaphy was noted in the undeformed North Pacific crania in 0.8% on the right, 1.6% on the left, and 0.8% on both sides. This insignificant frequency does not conform with *Anutschin's* (*Martin* 1914, 780) findings of 3.0 % in Mongols of North Asia, 5.8% in Mongols in general, and even 8.2% in Chinese. It is an interesting fact, however, that the frequency of stenocrotaphy rises in the deformed skulls of the North Pacific Coast.

Among the main measurements observable in norma lateralis are those of the cranial length and height. The former has been discussed in connection with the norma verticalis. The basion-bregma height of B is 134 mm., of C 125 mm., and of E 133 mm. Compared with the height averages of 129.9 mm. and 122.4 mm. of the two sexes of the San Miguel skull series, the cranial heights of the Santa Barbara skulls exceed them. This is demonstrated also by their relative position within the ranges of variation of 120–139 mm. and 115–130 mm. for the San Miguel males and females. The length-height index becomes accordingly 77.0 for skull B, 74.9 for skull C, and 78.7 for skull E, rendering the two males hypsicranial, the female orthocranial, but at the border line of orthocrany and hypsicrany. The relatively high individual values of the length-height index of the Santa Barbara crania are somewhat disproportionate to the San Miguel averages of 72.5 and 71.4 in the two sexes, although covered by the range of variation of the latter. The difference is due, as will be seen from the table of measurements, to both the greater length and the lesser height of the San Miguel skulls. In dolichocranial Mongoloid varieties like the Eastern Eskimo, the length-height index is naturally decisively influenced by the relatively greater cranial length. Thus, while the basion-bregma height in that human variety (*Oetteking* 1909) yielded an average as high as 134.6 mm., at a range of from 128–144 mm., the length-height index yielded only an orthocranial average of 73.7, owing to the greater cranial length averaging 182.3 mm. from a range of 171–200 mm. Chamæcrany, on the other hand, is the prevailing condition in the paleolithic skulls (La Chapelle-aux-Saints = 62.9, and approximately: Piltdown = 68.4; Galley Hill = 67.4), owing here to their excessive cranial length, which amounts to 208 mm. in the first-named skull.

The cranial ear-heights (porion-bregma) nearly coincide with 112 mm. in B and 111 mm. in C, while E has only 109 mm. A pronounced sex difference was noticed in the San Miguel skulls, where the males attained an average of 111.2 mm. against 104.2 mm. for the females. The difference between their basion-bregma and porion-bregma heights is the result of different infraporial extension. The basion-porion portions of the cranial height measure 22 mm. in B, 14 mm. in C, and 26 mm. in E, showing the two male skulls considerably in excess of the female skull. This seems to be the general condition between the two sexes, although *R. Virchow* (quoted by *R. Martin* 1914, 691) found the position of the porion to be higher in Frisian women. In our frequently mentioned San Miguel series there is an average infraporial extension of 20.3 mm. in men and 17.9 mm. in women, varying from 13 mm. to 30 mm. and 12 mm. to 24 mm. respectively. Males and females combined yield an average of 19.9 mm., which ranges among the highest quoted by *Martin* (p. 691), comprising the Maori with 19.4 mm., Papuans with 20.3 mm., and Old Egyptians with 21.6 mm. The infraporial height varies according to the same author from 6 mm. to 26 mm. in the human varieties.

The ear-heights brought into proportion with the length measurements of 174 mm., 167 mm., and 169 mm., in the three Santa Barbara skulls, give rise to indices of 64.4 for B, 66.5 for C, and 63.9 for E. Applying for the ear-height index the same nomenclature as used for the cranial height index, all our skulls turn out hypsicranial, the female even more than the two males. The ear-height index reverses somewhat the calculations of our cranial height index in so far as skull C (♀), which was found to be orthocranial by the latter, is hypsicranial by the former, and even exceeds the two male skulls in ear-height hypsicrany. The reason is to be seen, first, in the smaller infraporial extension of the height diameter in C, and, secondly, its smaller cranial length. The San Miguel averages of the ear-height index at 61+ are orthocranial, although their range of variation comprises also a number of hypsicranial individuals.

From a general point of view it seems that the peoples of Mongol extraction manifest a tendency toward hypsicrany, while the true Mongols (Buriat, Ostiak, Kalmuck) are rather platycranial.

The measurements just discussed are listed in the following table.

HUMAN VARIETY	CRANIAL HEIGHT MEASUREMENTS					
	length *mm.*	height *mm.*	$\frac{\text{height} \cdot 100}{\text{length}}$	Infraporial height (basion-porion) *mm.*	Porion bregma height (ear height) *mm.*	$\frac{\text{Ear height} \cdot 100}{\text{length}}$
Santa Barbara						
B (♂)	174	134	77.0	22	112	64.4
C (♀)	167	125	74.9	14	111	66.5
E (♂)	169	133	78.7	26	109	63.9
San Miguel island						
Averages ♂	177 (168–193)	129.9 (120–139)	72.5 (66.3–79.3)	20.3 (13–30)	111.2 (100–118)	61.5 (56.8–66.7)
Averages ♀	170 (164–175)	122.4 (115–130)	71.4 (66.9–76.0)	17.9 (12–24)	104.2 (100–118)	61.3 (59.4–64.9)

The median-sagittal arc is, with 359 mm., largest in the male B, while that of the other male, E, measures 342 mm., and the female, C, only 340 mm. This is in conformity with about average conditions on the coast of southern California, but conspicuously less than the averages of tribes farther north, like the Haida with male and female averages of 371.2 mm. and 355.2 mm., or the Western Eskimo at 366.4 mm. and 356.6 mm.

Of greater interest is the participation of the individual arcs that constitute the median-sagittal arc. The proportional lengths of the frontal, parietal, and occipital divisions are as 119–120–120 mm. in B, 114–126–100 mm. in C, and 113–105–124 mm. in E. The parietal arc exceeding both the frontal and occipital arcs in true human proportion is the condition met in the female skull C, and is only conditionally true of B. Here the three participants are almost of the same length, which is the exact proportion between the parietal and occipital arcs, while the frontal is only 1 mm. in default. The two arcs of the skull cap D, with 121 mm. for the frontal and 123 mm. for the parietal, retain the proportion as met in B and C. Fully out of the ordinary are the proportions of skull E, with 113–105–124 mm. The parietal arc is exceeded here by both the frontal and the occipital, owing in the latter perhaps to the excessive development of the interparietal part of the occipital squama. Agreeing with *Schwalbe* that in 50% of human skulls the frontal arc exceeds the parietal, while in 42.8% the reverse is true as a progressive proportion, the remainder going to the proportion of equality, skulls B, C, and D are seen to conform with the progressive state, while E marks in every respect the opposite. Equality of frontal and parietal arcs at 121 mm. was noted in La Chapelle-aux-Saints. The larger frontal arc, however, seems to be the prevailing condition in the undeformed skulls from the North Pacific Coast, where the three proportions—frontal arc greater than parietal, equal with parietal, or smaller than parietal—occur in the males in the proportions 82.1%–3.8%–14.1%, and in the females in 82.3%–5.9%–11.8%.

The measurements just discussed are combined in the following table.

HUMAN VARIETY	MEDIAN-SAGITTAL ARC							
	Arc				Fronto-parietal proportions			
	Median-sagittal mm.	Frontal mm.	Parietal mm.	Occipital mm.	Par. arc · 100 / front. arc	F > P %	F = P %	F < P %
Santa Barbara....								
B (♂).........	359	119	120	120	100.8	—	—	—
C (♀).........	340	114	126	100	110.5	—	—	—
(D ♂).........	—	121	123	—	101.7	—	—	—
E (♂).........	342	113	105	124	92.9	—	—	—
North Pacific Coast Undeformed								
Averages ♂...	363.6 (317–395)	127.2 (109–145)	119 (88–139)	117.6 (103–140)	93.6	82.1	3.8	14.1
Averages ♀...	350 (325–380)	122.3 (113–135)	115 (102–131)	112 (98–123)	95.6	82.3	5.9	11.8
La Chapelle-aux-Saints............	357	121	121	115	100.0	—	—	—

Important in a racial diagnosis are declination and curvature of the frontal bone, because both determine the relative position of the forehead in the cranial complex. *Hrdlička* (1907, 1908) has repeatedly called attention to the "low forehead" in non-deformed Indian skulls, but without proving his observations methodically. From his comments it is quite clear that low vaulting, as well as different degrees of sloping, was involved. At first glance our three skulls give the impression of the distinctive development of both those conditions. However, this is somewhat deceptive with regard to the declination of the frontal bone, as will be seen. The angles formed by the nasion-bregma chord with a parallel of the ear-eye plane passing through the nasion are 48° in B and E, and 51° in C, thus preserving between themselves the predominance of the female angle over the male—the condition most frequently present. The Santa Barbara skulls fall well within the variation of, for instance, the San Miguel islanders of (39) 43–54°, and whose averages are 47.2° for the males and 46.4° for the females. Lower averages, at least for the males, were found for the Haida, namely, 43.6° and 50.4°, while the Western Eskimo have 46.1° in both sexes. Taking further into consideration the averages of North Pacific undeformed skulls, amounting to 46.0° and 48.1° in the two sexes, the variations running from 40° to 54° and 43° to 54° respectively, it is clear that we cannot attribute to our skulls any exceptional position among the Pacific groups as regards the declination of the frontal bone. It may be of interest to cite in this connection the declination of the frontal bone in the La Chapelle-aux-Saints skull which, on account of its fair state of preservation among the Neandertaloids, admits of an orientation in the ear-eye plane. *Fr. Sarasin* (1916–1922, 210) found in that specimen an angle of frontal declination of 48°, which curiously enough coincides with that of the Santa Barbara males. The same author gives a European average of 49.5°, which as such demonstrates the predominance of the European frontal angle, although the Haida female average reached as high as 50.4°. An obvious difference was noted in seven Chimpanzee skulls with an average of 35°.

The impression of low frontal vaulting, as mentioned above, is borne out by the measurements. The median-sagittal frontal index amounts to 91+ in skulls B, D, and E, and 92.1 in skull C, expressing well-marked flatness of the frontal vault. Drawing the line at 90 between orthometopism and chamæmetopism, our skulls are seen to be chamæmetopic, and the female more so than the males. The indices mark a condition of flatness which exceeds all the racial averages of *Martin's* (1914, 765) table, and which occur there between the figures 87.1 and 89.1. Their indices exceed even the highest individual indices of the Haida at 90.8 and 89.7, and of the Eskimo at 90.5 and 91.1 in the two sexes, while the San Miguel Island skulls comprise individual indices as high as 96.8 in the males and 91.2 in the females, which latter is level with the Santa Barbara males. Astonishing again is the well-curved forehead in the Neandertaloids at 87, conforming with the European average. The Chimpanzee skulls also, at 89.5, have better vaulted frontals. These conditions are likewise expressible by the angle of frontal curvature which is formed by two lines extending from the point of highest elevation of the median-sagittal frontal curve above its chord (frontal acrion [mihi], to distinguish it from the parietal and occipital acria) to the nasion and bregma respectively. Depending somewhat on the length of the chord, the angle nevertheless is expressive of the frontal curvature in such a way that the greater angle indicates the lesser vaulting, and vice versa. Our specimens B and C present angles of 140° each, while E rises to 142°, but D attains to only 135°. Comparing these figures (see table) with those given by *R. Martin* (1914, 766), it is immediately observed that the Santa Barbara skulls range with the Neandertal skull. Compared with the averages given for Alsatians and Australians, Neandertal, as well as our skulls shows a distinctly flatter forehead.

The glabella-projection is only mildly developed. As the highest points of the glabellar curves do not in anterior projection exceed the nasion in the properly oriented skulls (ear-eye plane), *Mollison's* (1908, 575) index of glabella-projection in advance of the nasion-vertical and glabella-height above the nasion-horizontal was not applicable. Thus another method based on absolute measurements had to be resorted to. The most reliable of several methods that offered themselves seemed to be that proposed by *Fr. Sarasin* (p. 211), who computed an index from the glabellar arc and chord, the latter marking the distance between the nasion and supraglabellare, i.e., the deepest point between the fronto-glabellar and fronto-cerebral median-sagittal curves. The indices derived from the absolute measurements for the glabellar arc and chord differing 1–2 mm. in the individual skulls, are in B and C 95.8 and 96.0, and in D and E 92.0 and 92.3. Although these indices are indicative of only slight bulging, *Fr. Sarasin* gives an average for European men of 98, signifying a still less vaulted glabella than that of the Santa Barbara. His New-Caledonian men yielded a markedly lower average of only 91.1 in illustration of strong glabellar vaulting, at a variation of 82.8–97.8, but a female one of 97.2, ranging 92.2–100.0. For further comparison

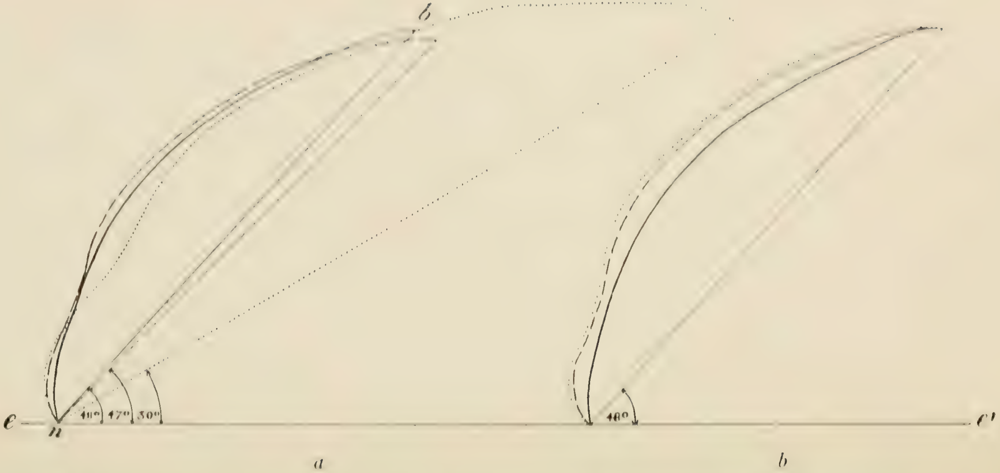


Fig. 9.—Median sagittal frontal outlines in superposition: *a*, in natural size and individual angularity; *b*, sizes and angles adjusted to those of skull B. ———— Santa Barbara B (♂); – – – – – Swabian (No. 4555, A. M. N. H.); .... Neandertal. *e*—*e′*, parallel of ear eye plane passing through *n*, nasion; *b*, bregma; ∠ *b*—*n*—*e′*, angle of frontal declination. (½ natural size.)

Fr. Sarasin's findings upon Neandertaloid crania may be given, namely, 80–83, and it is furthermore seen that his lowest New-Caledonian male of 82.8 fits with those. The glabellar protrusion is naturally greatest in a series of Chimpanzee skulls at an average of 78.1 from a range of 70.1–81.8.

In order to show some of these conditions in a graphic way, the frontal outlines of a European and the Neandertal calotte have been superposed in fig. 9, *a*, upon that of our skull B. They are oriented on the ear-eye plane at their individual angles of frontal declination. The Neandertal outline was approximately oriented on the ear-eye plane in such a way that in adjustment with the orientation of skull B, the angular difference between this skull's ear-eye and nasion-inion lines (which latter is the line of orientation of the Neandertal calotte!) was subtracted from the frontal angle of the Neandertal. The result is an angle of 30°. This procedure is justified only in this particular case in view of the fact that the frontal angle of B represents in a way an average condition of frontal angularity; it is by no means supposed to be final. In *b* of the same figure the same three outlines as in *a* are again superposed, the frontal chords reduced to the length of that of B, and their angles of frontal declination adjusted to the latter's angle of 48°. This shows to better advantage the differing amount of frontal vaulting, disclosing at the same time the more pronounced one of the Neandertal forehead which exceeds even that of the European.

The measurements discussed in connection with the frontal bone are assembled in the next table.

HUMAN VARIETY AND ANTHROPOIDS	OS FRONTALE							
	∠ Nasion-bregma (ear-eye plane)	Median-sagittal			Glabellar			∠ Frontal curvature (nasion-acrion-bregma*)
		arc *mm.*	chord *mm.*	chord·100 / arc	arc *mm.*	chord *mm.*	chord·100 / arc	
Santa Barbara								
B (♂)	48°	119	109	91.6	24	23	95.8	140°
C (♀)	51°	114	105	92.1	25	24	96.0	140°
(D ♂)	—	121	108	91.2	25	23	92.0	135°
E (♂)	48°	130	103	91.2	26	24	92.3	142°
San Miguel island					New Caledonians (*Fr. Sarasin*, 1916–1922) ♂ 26.7 (21.0–34.0) ♀ 22.7 (19.0–26.0)	♂ 24.3 (20.0–29.5) ♀ 22.0 (19.0–24.5)	♂ 91.1 (82.8–97.8) ♀ 97.2 (92.2–100.0)	§ Alsatians 130°♂, 131°♀ Australians 131° Kalmucks 136° Neandertal 139° Spy I 151°
Averages ♂	47.2° [(39)43–54]	122.3 (109–140)	109.8 (101–120)	88.7 (83.1–96.8)				
Averages ♀	46.4° (44–50)	118.5 (114–124)	104.3 (98–113)	88.7 (84.7–91.2)				
Haida								
Averages ♂	43.6° (40–54)	129.3 (118–145)	113.8 (105–145)	88.1 (85.0–90.8)				

Averages ♀	50.4° (46–54)	123.7 (117–133)	109.0 (104–115)	88.1 (85.7–89.7)				
Eskimo								
Averages ♂	46.1° (41–53)	129.3 (118–145)	113.8 (106–128)	88.1 (84.9–90.5)				
Averages ♀	46.1° (43–52)	124.7 (121–135)	110.2 (107–117)	88.4 (85.9–91.1)				
Europeans† ♂	49.5° (46–54)	—	—	87.4 (85.4–89.3)	—	—	98 (96–100)	—
La Chapelle-aux-Saints†	48°	—	—	87.5–88	—	—	80–83	—
Chimpanzee†	35° (31–41)	—	—	89.5 (87.1–90.8)	—	—	78.1 (70.1–81.8)	—
Neandertal‡	—	133	119	87.2	—	—	80–83	—

---

* The angle is formed by two lines connecting the nasion and bregma points with the greatest elevation of the medium sagittal frontal curve (*R. Martin* 1914, 536). The present writer proposes for this hitherto unnamed point the term acrion (from ἄκρος, highest, apex), which may be distinguished as a frontal, parietal, or occipital one.

† *Fr. Sarasin* (1916–1922, 205 sq.).

‡ *Schwalbe* 1899.

§ *R Martin* 1914, 766.

Following up the cranial outline posteriorly, a marked post-bregmatic elevation is noticed. This is particularly true of the female skull and coincidental with its higher sagittal frontal index. As the maximum or total cranial height is rarely identical with the basion-bregma height, it is quite natural that the highest point of the cranial vault, the vertex, falls behind the bregma also in European skulls. But pronounced cases may duly be signified as morphologically inferior, especially if accompanied by low vaulting of the forehead as in our skulls, which again is commensurate with the development of the frontal brain. A comparative demonstration of these conditions has been attempted in fig. 10, *a*, *b*, where the horizontal e-e′ is a parallel to the ear-eye plane laid through the bregma. In *a* the differences of post-bregmatic elevation are shown in our three skulls, C

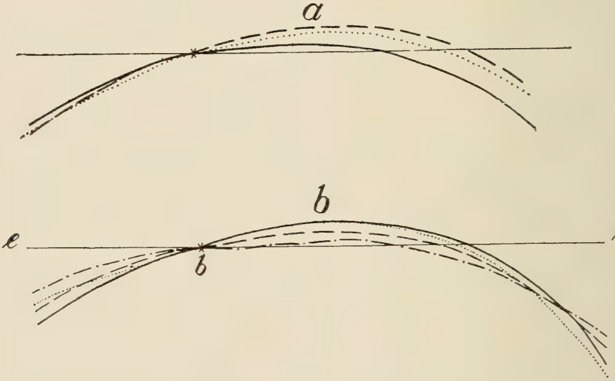


FIG. 10.—Post-bregmatic elevation. Superposition of outlines: *a.* ——— Santa Barbara B (♂); ----- Santa Barbara C (♀); ...... Santa Barbara E (♂). *b.* ——— Santa Barbara C (♀); ----- Swabian (No. 4555, A. M. N. H.); ...... Senoi (*Martin* 1905); —.—.— Ainu (No. 1634, A. M. N. H.). *e—e′*, parallel to ear-eye plane through *b*, bregma. (½ natural size.)

exceeding B and E, and amounting to 5 mm. as against 2 mm. and 4 mm., and occurring 3 cm. behind the bregma in C and E, and 2 cm. in B. In *b*, the parietal outlines of a Senoi, a Swabian, and an Aino are seen superposed upon that of C, which represents the highest postbregmatic elevation. This racial order of individual values is, of course, fortuitous. It is of interest, however, that the outline of highest post-bregmatic elevation coincides with low, and that of least elevation with high, frontal vaulting.

The parietal angle between the bregma-lambda line and a parallel to the ear-eye plane passing through the lambda is not affected by the post-bregmatic elevation, since its variation depends on quite different factors, such as the position of the bregma and lambda, and post-bregmatic extension of the skull. The angles are fairly identical at 30° in the male B, and 29° in the female C, but it drops to 20° in E, owing to the comparatively shorter parietal arc which is compensated by an occipital arc of considerable length. The first two values conform exactly with the averages of the Western Eskimo. The Haida, on the other hand, have slightly lower averages of 27° in both sexes, resulting quite probably from their tendency toward longheadedness.

The sagittal parietal vaulting is well developed and illustrates, with indices of 89.2, 86.5, 87.8, and 91.4 for skulls B, C, D, and E, the variable conditions generally met in Indian skulls. The higher male indices indicating a slightly flatter bend seem to be likewise a generally prevailing condition, which is corroborated by the Haida and Eskimo indices in the subjoined table, where the factors underlying the sagittal parietal index also are listed. It will be noted that the averages for the parietal arcs of the Santa Barbara skulls, as well as of the groups mentioned there, present values near 120 mm. This is in conformity with the average value for the median-sagittal parietal arc in brachycrany which *R. Martin* (1914, 747) gives as 122 mm., while that of dolichocrany lies at 130 mm.

HUMAN VARIETY	OS PARIETALE			
	Median-sagittal			∠ bregma-lambda on ear-eye plane
	arc *mm.*	chord *mm.*	$\frac{\text{chord}\cdot 100}{\text{arc}}$	
Santa Barbara				
B (♂).......	120	107	89.2	30°
C (♀).......	126	109	86.5	30°
(D ♂).......	123	108	87.8	—
E (♂).......	105	96	91.4	20°
Haida (♂)				
Averages ♂...	119.6	107.7	89.9	27.4°
	(103–134)	(94–120)	(83.1–92.5)	(20–38)
Averages ♀...	119.8	105.8	88.1	27.8°
	(115–131)	(101–115)	(86.4–90.4)	(23–33)
Eskimo (Western)				
Averages ♂...	121.5	108.4	89.3	30.2°
	(107–139)	(98–117)	(81.3–92.9)	(24–38)
Averages ♀...	117.7	104.7	88.9	29.5°
	(110–131)	(98–115)	(86.5–90.3)	(27–38)

What was said with respect to the median-sagittal parietal vaulting does not hold true for the occipital one. The higher indices here, indicating lesser curvature, are those of the females. Skull C (♀) has a median-sagittal occipital index of 87.0, while the corresponding indices of B (♂) and E (♂) are 83.3 and 84.7. But the remarkable fact about the entire posterior outline (bregma-opisthion) in Santa Barbara specimens B and C, less so in E, is the almost semicircular bulging with hardly any interruption at the lambda or inion. *Martin* (1905, 465–466) describes this condition as characteristic of the Senoi and as depending partly upon the position, i.e., declination of the planum nuchale of the occipital bone, as indicated by an angle between the opisthion-inion line and the ear-eye plane, or rather the parallel of the latter passing through the inion. The angle with the inion for its vertex opens toward the cranial cavity if measured below the inion-parallel of the ear-eye plane. The compensatory angle lies above it and opens outwardly. It is clear that a more erect position of the planum, as expressed by a greater angle, is more conducive of a perfect occipital rounding than the opposite, which, however, is easily disturbed by other morphological features, like the protrusion of the upper occipital squama, and, as *Martin* correctly points out, the development of the protuberantia occipitalis externa. His listings of the nuchal angle are quite instructive and are presented on page 60.

The nuchal angles of 23° in the Santa Barbara B skull, and 34° in the C, and even 38° in E, are comparable with *Martin's* highest figures, and thus justify what has been said about their significance with regard to the occipital curve. The nuchal angle in a way bears on the interoccipital angle opisthion-inion-lambda in such manner that

GROUP		NUCHAL ANGLE
Senoi	♂	36°
Senoi	♀	30°
Usa	♂	28°
Disentis	♂	23°
Timorese	♂	21°
Vedda	♂	18°
Vedda	♀	17°
Hohberg	♂	17°

in our cases the higher and lower figures appear to be correlated, 23° to 124°, 34° to 128°, and 38° to 127°. Also another correlation is to be noticed between the nuchal angles and those of occipital declination as given by the angle between the opisthion-lambda line and the ear-eye plane. The more erect position of both the opisthion-inion and opisthion-lambda lines in C and E finds its expression through a greater nuchal angle of 34° and a smaller occipital angle of 118° in the former, and still more significant in the latter of 38° and 109°, as against 23° and 122° for the same angles in B. Another correlation seems to exist between these angles and the median-sagittal index, as may be seen from the next table. The stronger occipital vaulting appears to be characteristic of the male skull, which seems to be the prevailing condition among the sexes of the Indians. The variability of the averages of this index is very limited, *Martin* (1914, 738) listing them for a number of human groups between 81.2 and 83.6. Among our own observations were male and female averages from undeformed skulls of the North Pacific

Coast at 82.3 and 83.8; the Haida at 81.8 and 84.1, the Eskimo at 83.8 and 84.0. But very considerable is the individual variation which, for instance, amounts to 77.4–91.2 and 80.8–88.7 in the first-named group.

The occipital measurements discussed in the immediately preceding paragraphs are listed in the following table:

HUMAN VARIETY	OS OCCIPITALE					
	Median-sagittal			Angles with ear-eye plane		∠ opisthion-inion-lambda (interoccipital)
	arc *mm.*	chord *mm.*	$\frac{\text{chord}\cdot 100}{\text{arc}}$	opisthion-lambda (occipital)	opisthion-inion (nuchal	
Santa Barbara						
B (♂)	120	100	83.3	122°	23°	124°
C (♀)	100	87	87.0	118°	34°	128°
E (♂)	124	105	84.7	109°	38°	127°
Haida						
Averages ♂	122 (108–140)	100.2 (92–113)	81.8 (77.4–91.2)	117.6° (105–131)	—	123.1° (115–134)
Averages ♀	111.7 (106–120)	93.9 (90–97)	84.1 (80.8–88.7)	117.9° (113–124)	—	122.8 (96–133)
Eskimo						
Averages ♂	116.2 (111–126)	97.2 (86–110)	83.8 (78.2–88.6)	120.7° (111–131)	—	127.9° (115–136)
Averages ♀	114.4 (106–123)	96.8 (88–103)	84.0 (77.6–88.6)	118.6° (114–126)	—	129.2° (119–140)

The more upright position of the planum nuchale as expressed by a higher nuchal angle may be correlated with the phylogenetic downward progression of the opisthion, and furthermore with the increasing foramen magnum angle. Formed by the basion-opisthion line and a parallel to the ear-eye plane laid through the basion, this angle expresses advanced morphological conditions if situated below that parallel and marked minus, the basion being the vertex. Its situation above the parallel is marked plus, and signifies more primitive stages as found in the anthropoid apes and occasionally in man. The Santa Barbara skulls have angles of −8° each in B and C, and thus represent a higher phylogenetic stage. In skull E, on the other hand, the basion-opisthion line coincides with the ear-eye parallel, indicating a neutral state between the more primitive and advanced stages of the foramen magnum declination. Compared with the San Miguel Island series, the averages of the latter are found to be still more progressive, with −9.4° in the males and −13.2° in the females. In spite of this, the variability is quite pronounced in that series, affording ranges of +3° to −21°, and −5° to −22° in the two sexes.

The writer's observations on a series of eighty Chinook skulls in the American Museum of Natural History may be of interest in this connection (*Oetteking* 1924). It is recalled that the Chinook practised excessive antero-posterior head deformation. The averages of foramen magnum declination were found to be +0.6° in the males and −0.5° in the females. Their ranges, from +14° to −15° in the former and from +7° to −14° in the latter, distinctly show the influence of deformation by their low values and great extensions.

The low value of +7° in La Chapelle-aux-Saints (*Fr. Sarasin* 1916–1922, 195), on the other hand, is directly expressive of the primitive phyletic stage of this specimen. *Fr. Sarasin* (p. 195) also gives a general average for Europeans amounting to −12°, with which the San Miguel averages mentioned in the second preceding paragraph conform.

The ear-eye parallel involved in the angle just discussed helps also to form the angle of the cranial base as represented by the nasion-basion line. This line measures 97 mm. in skulls B and C, and 101 mm. in E, and as the position of the nasion above the ear-eye plane proper is fairly alike in the three skulls (30 mm. in B and E as against 29 mm. on C), the size of the angles depends entirely on the infraporial position of the basion. With a basion-porion extension of 22 mm. in B, 14 mm. in C, and 26 mm. in E, the greater cranio-basal angle of 33° is naturally found in the two male skulls, while the angle in the female skull amounts to 27°. Within the physiological range of the angle under discussion in series from different human provinces and covering values from 20° to 39°, our two angles occupy stations only slightly removed from a medium condition. This is confirmed by an examination of averages which *Lüthy* (1912, 35) lists from 26.7° to 29.0°, the extremes being those of Singhalese and Australians. Our frequently quoted San Miguel islanders yielded averages of 30.2° in both sexes, and thus range with *Martin's* (1914, 484) Chinese at 30.5°. Considering furthermore the Western Eskimo averages for the two sexes of 31.6° and 31.0°, and those of the Haida of 29.9° and 30.0°, it appears that the peoples of Mongoloid extraction are possessed of steeper cranial bases than the other human varieties.

In close relation to the angular conditions of the cranial base line (nasion-basion) stand those of the pars basilaris of the occipital bone.

The declination of the pars basilaris measured on its underside, the angle being formed by the sphenobasion-basion line and the parallel to the ear-eye plane through the basion, amounts to 33° in skulls B and E and to only 22° in C. This signifies, according to *Fr. Sarasin's* (1916–22, 251) classification, platyclin and hyperplatyclin states and illustrates not only the sex difference generally met in human groups, but also the specific conditions among the Indians of the Pacific coast (*Oetteking* 1924). Moreover, in our particular case it is the limited infraporial extension of the cranial height diameter which is responsible for the depressed condition

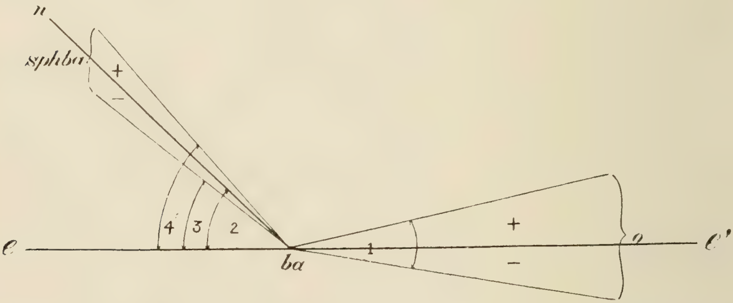


FIG. 11.—Schematic representation of angles at the cranial base: ∠ 1, foramen magnum angle; ∠ 2, angle of cranial base; ∠ 3, 4, angle of pars basilaris; *e—e′*, parallel to ear-eye plane through *b*, basion; *n*, nasion; *o*, opisthion; *sphba*, sphenobasion.

of the pars basilaris in C, and consequently its small angle of declination.

A schematic representation of the angles at the cranial base is given in fig. 11.

The following table contains the measurements just discussed:

HUMAN VARIETY	ANGLES OF THE CRANIAL BASE		
	Ear-eye plane and lines		
	opisthion-basion (foramen magnum)	basion-nasion (cranial base)	spheno-basion-basion (pars basilaris)
Santa Barbara			
B (♂)	−8°	33°	33°
C (♀)	−8°	27°	22°
E (♂)	≅	33°	33°
San Miguel island			
Averages ♂	−9.4° (+3 to −21°)	30.2° (25–35)	32.0° (19–46)
Averages ♀	−13.2° (−5 to −22°)	30.2° (25–34)	29.8° (20–38)
La Chapelle-aux-Saints*	+7°	—	14–20°

**Fr. Sarasin* 1916–22, 195 and 253.

Turning now to the profilation of the face, its vertical projection relative to the ear-eye plane must be considered first.[1] The three angles known as profile angles are: (1) the facial (nasion-prosthion-E′), (2) the nasal (nasion-nasospinale-e′), and (3) the alveolar (nasospinale-prosthion-e′). E′ and e′ indicate the extensions of the ear-eye plane or its parallels to the right. The angles themselves may be identified from the diagrams of pls. X–XII. Those of the Santa Barbara crania, and, for wider comparison, of a Pacific Coast tribe, groups from southern India, and of a European group, are listed in the table on page 67. For some of them *Flower's* index gnathicus, $\frac{\text{prosthion to basion}\cdot 100}{\text{nasion to basion}}$, could be ascertained, and at the bottom the physiological range for each angle and applying to human conditions in general is given.

---

[1] The discussion of the vertical declination of the orbit and the nasal bones has been joined with the study of the orbit and nasal aperture, and will be found in the section on the norma frontalis (pages 98–99).

The figures show the typical proportions obtaining in man: the nasal angle as the greatest exceeds the other two, and that of the alveolar process is the smallest. *Lüthy* (1912, 39) has proposed the following classification of the angles of vertical profilation:

Hyperprognathy................	x – 69.9
Prognathy.....................	70.0 – 79.9
Mesognathy....................	80.0 – 84.9
Orthognathy...................	85.0 – 92.9
Hyperorthognathy..............	93.0 – x

According to this classification the facial angles of our skulls B, C, and E, are seen to be prognathous at 77°, just mesognathous at 80°, and pronounced mesognathous at 82°. The same proportions hold true for the nasal angles at 78° in B, and 84° in C and E, which places the latter two skulls close to orthognathy. Quite remark-

HUMAN VARIETY	VERTICAL PROFILATION (EAR-EYE PLANE) Angle			INDEX GNATHICUS (FLOWER)
	facial	nasal	alveolar	
Santa Barbara				
B (♂)	77°	78°	71°	106.3
C (♀)	80°	84°	68°	104.1
E (♂)	82°	84°	76°	96.0
San Miguel island				
Averages ♂	81°	83.2°	74.6°	99.0
	(72–88)	(76–91)	(61–91)	—
Averages ♀	80.2°	84.4°	74.6°	99.7
	(75–89)	(77–89)	(62–89)	—
Senoi*				
♂	85°	90°	55°	—
♀	82°	85°	66°	
Semang†				
♂	80°	82°	65°	100.0
♀	81°	83°	75°	98.0
Averages Vedda‡	84.3°	87.6°	71.6°	94.7
Averages Singhalese‡	82.1°	85.5°	69.9°	99.2
Averages Swiss‡	87.0°	88.7°	82.4°	93.6
General variation‡	70–93°	73–95°	49–92°	—

***Martin* 1905.
† *Schlaginhaufen* 1907.
‡ *Lüthy* 1912.

able is the relapse into the prognathous state of the alveolar angle of 71° in B, and the hyperprognathous of 68° in C, while E at 76°, although likewise prognathous, holds an intermediate position between the first two. Besides the pronounced state of alveolar hyperprognathy in the female skull, the other interesting fact is revealed that it coincides in the same skull with the distinct superiority of the facial and nasal angles over male skull B. This interesting combination in a similar way obtains in the averages of the San Miguel series, and is fully equaled by the Senoi, Semang, Vedda, and Singhalese. The individual figures of the Senoi and Semang show the two conditions even exaggerated, i.e., a decidedly stronger alveolar prognathism, excepting in the Semang woman, and a more pronounced tendency toward orthognathy of the two facial angles, as compared with the Santa Barbara specimens. The differences between the averages of the Vedda and Singhalese in each of the three angles are, according to *P.* and *F. Sarasin* (1893, III), notable from the standpoint of a phylogenetically secondary and stronger prognathism in the phylogenetically younger Singhalese. Regarding the alveolar prognathism, our Santa Barbara specimens show closer affinity to the averages of both the latter groups, while their two facial angles are markedly less orthognathous.

The different findings in all these groups are exceeded by those of the Swiss, who, as a European group, are included in the table for comparison. With distinctly orthognathous facial angles they are seen to combine well-marked alveolar mesognathy of 82.4°. Alveolar orthognathy even of 85° and 86° on an average obtain in two other European groups—the Tyrolese and the Bavarians (*Martin* 1914, 809).

All these findings gain in significance under the consideration of the stations which they occupy in the ranges of variation at the bottom of our table. It will be noted that, with the exception of Santa Barbara skull B, most of the facial angles hold medium or supramedium positions which is equal to mesognathy with a tendency toward orthognathy. The same cannot be said of the alveolar range, which *per se* is considerably wider than the ranges of the two facial angles. Thus, the middle stations in that range are still decidedly prognathous, and only a few of our figures exceed the middle.

In the last column of the preceding table *Flower's* gnathic index reaches its highest values of 106.3 and 104.1 with our skulls B and C, marking both prognathous with reference to the facial angle and according to the classification of that index. The two methods are thus seen not to yield identical results, as the angle of facial profilation indicates a slightly mesognathous state of C. In the San Miguel series, on the other hand, the angle, as well as the index, results in mesognathous averages, signifying the conditions prevailing in general in the Mongoloids. The other indices are in agreement with the angular expressions, the other extreme being represented with an index of orthognathy of 93.6 in the Swiss.

NORMA BASILARIS

The basilar aspect is much alike in the skulls from Santa Barbara, in that the occipital region is fairly of globular shape, which, however, is slightly modified in skull E. Only the radius of occipital extension posterior of the foramen magnum (opisthion) differs according to the individual size of the skulls and measures about 60 mm. in B, 45 mm. in C, and 44 mm. in E. The greatest width extension of the skulls in the basilar aspect is somewhat covered in perspective by the supramastoidal expansion, the mastoids themselves slanting mesially only insignificantly, which condition is still better to be observed in the occipital norma.

The shape of the foramen magnum is almost circular in B, but narrows slightly anteriorly in C and E. The circular shape, or the tendency toward it, seems to be the predominant one in skulls of Mongoloid extraction; it occurs in the San Miguel islanders in 41.0%. This is likewise expressed by the length-width index of the foramen magnum at 93.8 in B, 90.9 in C, but only 77.8 in E. The length measurements amount to 32 mm., 33 mm., and 36 mm. in skulls B, C, and E, those of the width to 30 mm. in B and C, and 28 mm. in E. *Martin* (1914, 743) gives physiological ranges of these two dimensions extending from (25) 30–40 (43) mm. for the length and from (20) 23–38 mm. for the width. The foramina of the Santa Barbara skulls are thus to be characterized as submedium in size. This holds true also for the averages in the San Miguel series at 33.6 mm. and 32.8 mm., and 28.6 mm. and 27.3 mm., for the two dimensions and sexes, while their indices at 84.8 and 83.2 are expressive of foramina of slightly longer shape (37.3% elliptic and 21.7% oval). The range of variation is not very extensive. The averages in *Martin's* table (p. 714) run from 72.6 to 89.1, and the sex difference almost throughout is expressed by lower figures for the females. A very low index in illustration of a foramen magnum of considerable length (46 mm.!) is that of La Chapelle-aux-Saints, namely, 65.2.

Some comparative foramen magnum measurements are listed in the following table.

HUMAN VARIETY	FORAMEN MAGNUM		
	length *mm.*	width *mm.*	$\frac{\text{width}\cdot 100}{\text{length}}$
Santa Barbara			
B (♂)	32	30	93.8
C (♀)	33	30	90.9
E (♂)	36	28	77.8
San Miguel island			
♂	33.7 (29–38)	28.6 (24–33)	84.8 [71.4–97.1 (103.5)]
♀	32.8 (29–37)	27.3 (24–31)	83.2 (72.7–93.1)
La Chapelle-aux-Saints	46	30	65.2

The condyles are medium high and wide, their angular position resulting in intervals of 21 mm. in B and E, and 19 mm. in C, between the most anterior points of their articulating surfaces. The articular surface of the left condyle in C is posteriorly drawn out about 1 cm. around the circumference of the foramen magnum, tapering beyond the fossa condyloidea and ending on a roughened ridge which ends about 1 cm. before reaching the opisthion. The right condyle is constricted at its posterior end and about 1 cm. in advance of the fossa condyloidea, the articular surface thus acquiring a slipper-like appearance. The canales condyloidei are above medium width, circular at their entrance and approached through narrow funnel-like fossæ condyloideæ, more so in the males than in the females.

The canales hypoglossi are of medium size in our skulls, but an anomaly, namely, bipartition, is noticed in each. This is not of very rare occurrence in this region, and was proclaimed by *Kollmann* (1905, 1907) as a "manifestation of the occipital vertebra." In the tribes of the North Pacific Coast not addicted to artificial deformation, bipartition was found in 20.5%, distributed among its variable forms in such a way that 4.9% of bipartition occur on the right, 11.5% on the left side, and 3.3% on both sides. The remaining 0.8% accounts for a case of left occurrence, while a canalis hypoglossi is absent on the right side. Our skull B shows a complete bipartition on the right side, skull C an incomplete one on the left. The latter case is complicated in such a way that from the medial superior edge of the canalis an osseous spicule, between 2 mm. and 3 mm. in length, runs free, ending free on a level with the plane of the medial opening of the canalis hypoglossi. The lateral opening is drawn out posteriorly. The extension, 3.5 mm. long and 2 mm. broad, is level with the lateral wall of the right condyle and forms a kind of vestibule to the funnel-like entrance of the canalis. Quite singular is the bipartite formation of the right canalis in skull E, which does not represent, in the ordinary sense, a bipartition of the medial outlet of the canal. There are, on the contrary, two independent outlets of relatively small size, one at the base of the condyle and the other 9 mm. above it at the base of the tuberculum jugulare. These two outlets have a common entrance of slightly enlarged size at the usual place on the lateral wall of the condylar base. It appears that a singular case like this serves to support the "manifestation" theory still better than the ordinary bipartition. All three cases are depicted in fig. 12.

The jugular foramina show no anomalies except in size. In B it is the left foramen that is almost twice the size of the right one, while in C the right foramen exceeds slightly the size of the left. An enormous widening of the right foramen is noticed in E. The left one in this skull is rather compressed and narrow, correlated quite probably with the canalis hypoglossi anomaly described in the last paragraph. Anomalies of size in the jugular foramina are more or less the rule in the human cranium, and occur, for instance, in undeformed Indians of North Pacific tribes in such a way that in 66.4% the right foramen is larger than the left, in 16.8% the left larger than the right, while in another 16.8% both are alike in size.

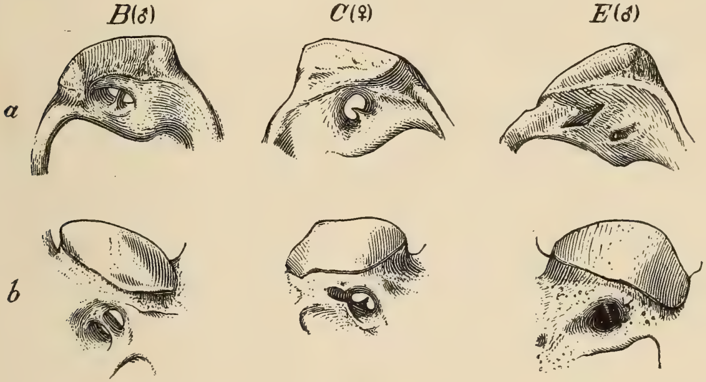


Fig. 12.—Canalis hypoglossi in the Santa Barbara skulls, showing different forms of bipartition. *a*, in medial, *b* in lateral aspect. ($\frac{1}{2}$ natural size)

The partes laterales of the occipital bone (processus jugulares) are slightly clubbed at their extreme ends, thus shielding medially deep incisuræ mastoideæ in B. These are much more shallow in C, commensurate with the size of the mastoid processes, but showing better developed sulci for the occipital artery than in B. Medium conditions obtain in E. The incisions of the apex of the mastoids are more or less in evidence. The styloid processes are destroyed in the three skulls; the styloid foramina are of medium size.

Of particular interest are the high vertically directed anterior tympanic plates drawn out into ample vaginæ for the styloid processes, and the deep mandibular (glenoid) fossæ. The transverse roots of the zygomatic process represent well-developed tubercula articularia in the two male skulls, but somewhat weaker ones in the female. The transverse axis of the tubercula nearly coincides with the frontal plane in B. In C and E, on the other hand, they slant slightly from medially forward to laterally backward. This condition prevails in the immature skull, where at the same time the notch between the free end of the zygomatic process and the portion of the temporal squama from which it springs is rather narrow. During growth, and as the masticatory functions develop, it widens, while the tuberculum articulare, under the molding influence of the mandibular condyles, assumes its definite appearance and direction. The latter conforms in B and E to the direction of the fossæ mandibulares and will be described more explicitly farther on in connection with the discussion of the lower jaw (see page 130).

The pars basilaris of the occipital bone, which is correlated with the proportions of the cranial base in general (*Martin* 1914, 746), appears to be more slender in female skull C. The underside shows the usual roughened surface, but no exceptionally developed muscular ridges. There is a well-developed tuberculum pharyngeum in B, and a weaker one in C and E, besides an indication of a fossa pharyngea in advance of it in the latter two. While the tuberculum is a fairly regular feature in the Indian skull (it occurs in 94.8% in undeformed skulls from the North Pacific areas), the fossa is much more rare at 16.1% in the same series. This percentage is in accord with that found by *Hrdlička* (1906, 62) in California Indians, while according to *Sullivan* (1920, 241), "the fossa is not of very frequent occurrence in the American Indian and Eskimo." The latter found it in only 3.5%, and its most frequent occurrence is "limited to that area of North America which is or was the home of the Uto-Aztecan stock."

There are irregularities to be noticed in connection with the foramina spinosa and ovalia. The former are above medium size in B, while the latter are long and somewhat narrow. The left one, furthermore, is transversely divided in such a way that an anterior small and oval division stands out against an extensive posterior one. The right foramen ovale shows an indication toward a division by slight projecting ridges on opposite sides of the foramen, or, rather, the canalis of which the foramen forms the outlet. The more interesting anomaly is seen in skull C. Here both foramina spinosa are medially open to the full depths of their canales, and merged with the canales musculotubarii. The condition described is illustrated in fig. 13; it is apparently very rare, while merging of the foramina spinosum and ovale is of less rare occurrence. The foramina in question are of medium size in E, but there is an additional foramen on the left side of the skull in advance of and in line with the foramen ovale, and a slight indication of one on the left side.

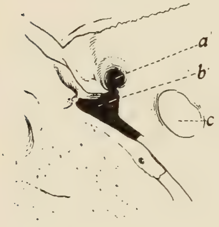


Fig. 13.—Merging of the left foramen spinosum and canalis musculotubarius in skull C (♀). *a*, foramen spinosum; *b*, canalis musculotubarius; *c*, foramen ovale. (Natural size.)

Advancing by way of the processus pterygoidei, whose two laminæ are well developed and thus afford deep pterygoid fossæ, we now enter upon the description of the palatine complexes. Their dimensions coincide well with the general proportions of the configuration in the basilar view, but otherwise are well developed. The palates themselves are spacious and deep, rather smooth, but with good-sized spinæ palatinæ, particularly in B. The spina nasalis posterior is nipple-shape in C, its two sides continuing into the broadly curved incisures of the palatine plates. These are narrower but deeper in B, forming medially the sides of a truncated spina nasalis of angular shape. In E it is broadly but pointingly drawn out. The three shapes as described in our three skulls are illustrated in fig. 14.

In the three skulls there are faint indications of a spindle-shape torus palatinus, especially in the female, which ends as a well-developed crest on the os palatinum in B and E, and as a narrow "keel" in C. It appears that the torus palatinus occurs with some regularity in Indians of the North Pacific Coast. Accounting for all its forms from a mere indication to a strongly developed torus, the frequency there was as high as 78.8% in undeformed crania, and higher at that in females than in males.

There is in skull C another noteworthy feature, namely, above the first molar of each side, where the palatine process flexes into the somewhat angularly joining alveolar process, a vascular orifice of 1.5 mm. in diameter. The foramina have direct connection with the maxillary antrum of each side, as the probe revealed, and probably transmit a branch of arteria palatina major (of a. palatina descendens). As such they are of quite different significance from the usual minute foramina nutricia of the palate, and form a singular feature in skull C. Fig. 15 shows this anomaly as marked by *x*.

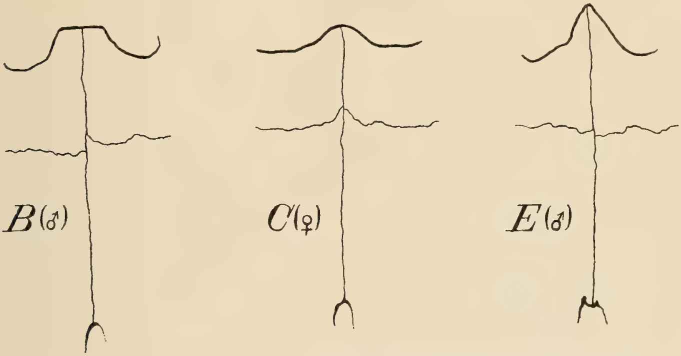


FIG. 14.—Variation in the shape of the spina nasalis posterior of the Santa Barbara skulls: truncated in B (♂); nipple-shape in C (♀); pointed in E (♂). The figure also shows variations of the sutura palatina transversa. (⅔ natural size.)

The foramina incisiva are of regular, i.e., medium, size, and more long than broad, and there are no traces of an incisival suture. The foramina palatina majora are slightly above medium size in B, smaller in C, and are less sharply edged than those of E. The foramina palatina minora are of the usual diminutive size, one on the right and two on the left side each of B and C, with the difference, however, that they do not appear on the inferior termination of the processus pyramidales, but are somewhat removed from it on their medial sides. The same holds true for skull E, in which, however, there are two foramina on each side.

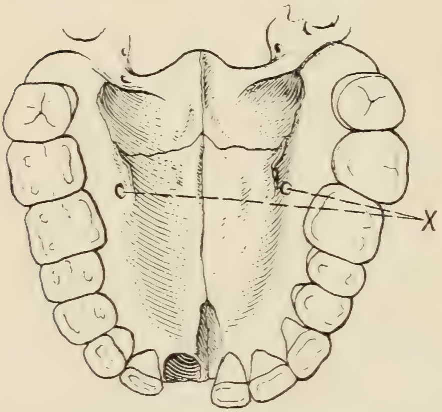


FIG. 15.—Anomalous palatine perforations, right and left in identical places, in skull C (♀), marked by *x*. ($\frac{2}{3}$ natural size.)

Of the two palatine sutures the median one shows the regular straight course and becomes slightly obscured through the formation of the medial crest of the palatine bones. The two parts of the transverse suture do not join medially in B, the left half joining the median suture at a right angle 3 mm. in advance of the right half, which turns sharply backward before reaching the median suture. In C the two halves turn backward and form a sharp posteriorly directed triangle, which is a rare condition in Hominidæ, according to *Martin* (1914, 830), the reverse being by far the more common state. In fact, the posteriorly directed triangle was found in only 5.6% of the undeformed North Pacific crania, in 2.5% of those of the Chinook, but in 9.9% of the Salish. *Martin's* highest frequency of the condition under discussion is 20.8% for the Eskimo. The more progressive forward bend is seen in E. All three shapes are illustrated in fig. 14.

It remains to discuss the part of most decided morphological significance in the palatine complex: the alveolar process and the dental arch. The latter is paraboloid in all three skulls, somewhat more rounded in B, and slightly straighter in C and E. They thus represent a morphologically advanced type as against the upsiloid shape in the anthropoid apes and the ellipsoid in the lower apes. All three types may occur in one and the same series, as shown by their frequency on the North Pacific Coast, where in the undeformed skulls the upsiloid type was found in 2.1%, the ellipsoid in 9.3%, and the paraboloid in 88.7%. The frequency of the first two types is somewhat increased in the Chinook to 6.0% and 20.5%, while the paraboloid type occurs in 73.5%, illustrating again the decided prevalence of the latter. As already indicated by the individual differences of the dental arches in our three specimens, the dimensions of their maxillo-alveolar processes likewise differ. Although of equal alveolar length, namely, 57 mm., the alveolar breadth of B measures 66 mm., that of C 63 mm. The two dimensions are smaller in E, namely, 50 mm. for the length and 60 mm. for the breadth. The indices computed from these two measurements are

115.8, 110.5, and 120.0 for our three skulls, rendering the male skulls brachyuranic, but B near the border line toward mesurany, the female mesuranic near the border line toward dolichurany. Group averages of the maxillo-alveolar index range, according to *Martin* (1914, 824), from 108 to 126, and within this range most of the averages are brachyuranic (115.0–x), particularly those of the Mongols and Mongoloids. Australians and Singhalese are the only varieties with dolichuranic means. The palatal dimensions differ in the length measurement contrary to the alveolar lengths of B and C, just described. The difference amounts to 3 mm. in favor of the male skull, whose palatal length measures 66 mm., against 63 mm. in the female. The dimensions are correspondingly smaller in E, where 44 mm. were listed for the length and 40 mm. for the width. The latter measures only 39 mm. in C, but 43 mm. in B. The indices result accordingly in 86.0, 84.8, and 90.9, placing the male skulls in the brachystaphylin class of the palatal index, the female in the mesostaphylin, but at the border line toward brachystaphyliny. The lower palatal index of C, mesostaphylin at 84.8, naturally signifies length-width proportions similar to those of the maxillo-alveolar, which was seen to be mesuranic at 110.5. Both indices, the maxillo-alveolar and the palatal of the Santa Barbara skulls, are expressive of conditions that prevail in Mongoloid peoples. They signify well proportioned, wide, and spacious dimensions, which is a European characteristic at the same time, and as such must be estimated an advanced condition.

To the table of maxillo-alveolar and palatal measure-

HUMAN VARIETY AND ANTHROPOIDS	MAXILLO-ALVEOLAR AND PALATAL MEASUREMENTS					
	Maxillo-alveolar			Palatal		
	length mm.	breadth mm.	breadth·100 / length	length mm.	width mm.	width·100 / length
Santa Barbara						
B (♂)............	57	66	115.8	50	43	86.0
C (♀)............	57	63	110.5	46	39	84.8
E (♂)............	50	60	120.0	44	40	90.9
Haida						
♂................	56 (52–60)	66.5 (61–71)	119.3 (108.5–129.3)	47.9 (45–52)	43.9 (40–49)	91.3 (76.8–108.0)
♀................	53.5 (50–57)	64.5 (61–69)	120.0 (115.2–127.1)	46.3 (44–50)	42 (38–45)	88.3 (80.4–97.1)
General range of variation.........	44–65	50–72	94–154	38–54	33–48	63.6–
Group averages*	49–57	58–69	108–126	42–50	36–43	94.6
Hylobates synd. ♀ *....	—	—	77.6 (74.1–82.3)	Hyoblates synd.	♂	46.6 (37.0–53.0)
Hylobates agilis*.......	—	—	80.2 (73.8–89.7)		♀	48.5 (43.1–52.1)
Orang-utan*						
♂................	—	—	74.8 (66.3–85.7)			49.2 (43.0–53.1)
♀................	—	—	81.9 (72.8–106.0)	—	—	51.2 (42.4–57.8)
Gorilla*						
♂................	—	—	64.7 (52.1–73.7)	—	—	42.2 (34.5–52.3)
♀................	—	—	72.5 (65.3–77.7)	—	—	46.3 (41.5–54.2)
Chimpanzee*						
♂................	—	—	80.8 (70.8–90.4)	—	—	53.0 (45.8–62.5)
♀................	—	—	82.0 (68.2–90.4)	—	—	54.0 (50.0–57.1)

*Martin (1914, 824, 827).

ments (page 81) the general individual ranges and those of group averages are appended in order to orient the quantitative nature of our specimens.

The anthropoids have been added to this table for the purpose of broader comparison in a morphological feature of greatest phylogenetic interest. Their indices are seen to differ radically not only from the human, but also between themselves.

NORMA FRONTALIS

The norma frontalis, or, as it is also termed, facialis, is complicated more than any of the other normæ by the proportions and configuration of the parts involved. They are in particular those that help in shaping the orbital and nasal cavities, the zygomatic expansion, and the alveolar process of the maxillary bone.

The frontal bone in the facial aspect shows in its squamous part nothing of particular interest. The tubera frontalia of moderate elevation seem to lie quite low, i.e., they begin to rise just above the superciliary depressions, which latter, although well marked, are nevertheless not broad. The superciliary region itself shows moderate development. The arcus superciliares in B and E represent stage *a* of *Cunningham-Schwalbe's* (see *Martin*, p. 770) classification, i.e., accounting for a margo supraorbitalis between the orbital rim and the sharply circumscribed arcus elevation. The latter shows still more pronounced forms in the E calotte. In C the arcus are somewhat wider and less sharply marked.

The glabella protrusion has already been discussed (page 51). The foramen s. incisura supraorbitalis, known to be very variable, is likewise so in the Santa Barbara specimens. Presenting two incisures in B, a right foramen and a left incisure are seen in C, D, and E. The statistical data of the North Pacific tribes revealed a predominance of the foramen, which occurred in the undeformed skulls in 61.4%, while the frequency of the incisure was 25.2%, and the irregular occurrence (right foramen and left incisure, or vice versa) amounted to 13.4%.

The incisura frontalis for the n. frontalis, of a diminutive appearance *per se*, is only slightly indicated in B. Its total absence amounted to 18.4% in the series mentioned in the preceding paragraph. The two-sided occurrence of an incisure, the predominating one, has a frequency there of 60.0%, that of a foramen frontale a frequency of 10.8%, and irregular occurrence was seen in 10.8%.

The lateral extension of the supraorbital portions of the frontal bone, i.e., the zygomatic processes of the latter, play an important part in the configuration of the facial norma. In the Santa Barbara specimens they point laterally somewhat more straight than usual and thus give the impression of a more pronounced postorbital constriction. These conditions have already been touched on (pages 29–30), where it was pointed out that the minimum frontal width, low but not excessively so, became a significant factor in the low transversal frontoparietal index. If brought in proportion to the upper facial breadth as measured between the two frontomalare temporale points, the most laterally situated points of the zygomatico-frontal suture, the significance of the minimum frontal width comes into play again, together with the unusual lateral extension of the zygomatic processes of the frontal bone. The fronto-biorbital index lending expression to these conditions amounts to 88.9 in skull B, 84.9 in C, 89.5 in D, and 81.0 in E. Taking *Schwalbe's* (1899, 97) index of 90 and higher as characteristic in recent skulls, it will be noticed that the Santa Barbara indices fall below that mark and thus join in with more primitive morphological behavior. *Fr. Sarasin* (1916–1922, 202) gives for Neandertaloids an average of 87.65, which almost coincides with the index of B, but ranges above that of C and E. One Carijo Indian from southern Brazil, mentioned above in connection with postorbital constriction (page 30), has as low an index as 83.3, which is even outdone with an index of 81.0 by our skull E. *Martin* (1914, 713) lists averages of 95.7 and 94.4 for male and female Bavarians, and 96.2 for Aino. These figures signify on'y a slight diversion between the two factors involved. But it must be considered that the lowest individual fronto-biorbital index in the Bavarian series was only 78, while the other extreme of the same series amounted to 102. The next table contains the measurements last discussed.

The figures make it plain that with the increasing difference between the two measurements involved, which in greater part is due to the decreasing minimum frontal width, the index also decreases.

In order to bring out their characteristics, the left frontal processus zygomaticus of skulls B and C is superposed in fig. 16, *a*, *b*, upon that of a skull from Santa

HUMAN VARIETY	FRONTO-BIORBITAL INDEX			
	fronto-biorbital index	upper facial breadth mm.	minimum frontal width mm.	difference
Santa Barbara				
B (♂)	88.9	108	96	12
C (♀)	84.9	106	90	16
(D ♂)	89.5	105	94	11
E (♂)	81.0	105	85	20
Carijo (Brazil) ♂	83.3	102	85	17

Cruz island (no. 537) with strongly curved zygomatic processes, oriented on a horizontal line through the supraorbital margins. The superpositions show the more curved process of the last-named skull in contradistinction to those of Santa Barbara.

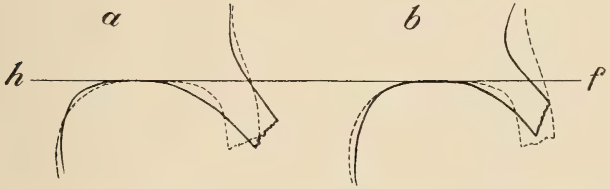


FIG. 16.—Superposition of left frontal processus zygomaticus in frontal projection of: *a*, Santa Barbara B (♂), and *b*, Santa Barbara C (♀), upon that of a skull from Santa Cruz Island, California (No. 537, M. A. I.), drawn in broken lines. *h—f*, frontal plane line through supraorbital margins in ear-eye orientation. ($\frac{1}{2}$ natural size.)

The nasal process (pars nasalis) of the frontal bone is likewise involved in the facial configuration, both by its length and its width. Its absolute height lies between the supraorbitale, i.e., the point of intersection between the median-sagittal plane and a line which connects the two supraorbital margins, and either the nasion or the infranasion (mihi).[1] In our series of skulls these distances amount to 7 mm. and 12 mm. in males B and E, 8 mm. and 11 mm. in female C, and 6 mm. and 10 mm. in male D, the differences between each two measurements accounting for the distance between the nasion and the infranasion. They are of course dependent on the extent of the encroachment of the nasal bones upon the nasal process of the frontal bone and therewith the form of the naso-frontal suture. In C this form corresponds to the curved one as described in a previous publication (*Oetteking* 1920), while that of B does not coincide with any of the six described there. Slanting upward from both sides, and then sloping mesially slightly downward, the two sides rise again to form a sharp triangle whose vertex lies in the median line. The whole formation might be taken as a variation of the trapezoidal form in the publication cited. The course of the naso-frontal suture of D is a curve, and that of E a triangle. Our four cases are illustrated in fig. 17. They show in the frontal aspect the individual behavior of the naso-frontal suture. In each case an auxiliary line was drawn for the determination of the infranasion measuring point. That the supraorbitale-infranasale distance affords a better means of ascertaining the proper height of the nasal process in the facial aspect is shown in *a* (San Miguel island, no. 318) of the same figure, where the infranasion lies on a level with the auxiliary line mentioned in the preceding paragraph. An impairment of the height measurement of the nasal process through the encroachment of the naso-frontal suture upon that process does not occur in this case.

---

[1] Measuring the height of the nasal process of the frontal bone in the customary way (nasion-supraorbitale) has never quite satisfied the present writer, for the reason that it does not account, in a morphological sense, for the true extent of that process. He has for that reason substituted his "infranasion" as the point of intersection between the median-sagittal plane line and a horizontal connecting the two "maxillo-naso-frontal points" (*Oetteking* 1920, 56), i.e., the meeting point of suturæ nasofrontalis, nasomaxillaris, and maxillofrontalis.

The width of the processus nasalis can best be judged by the distance between the two maxillofrontale[1] points representing the so-called anterior interorbital width, to distinguish it from the posterior one between, either the dacrya or the lacrimalia. The anterior interorbital width measures 20 mm. in B, 18 mm. in C, 21 (?) mm. in D, and 18 mm.

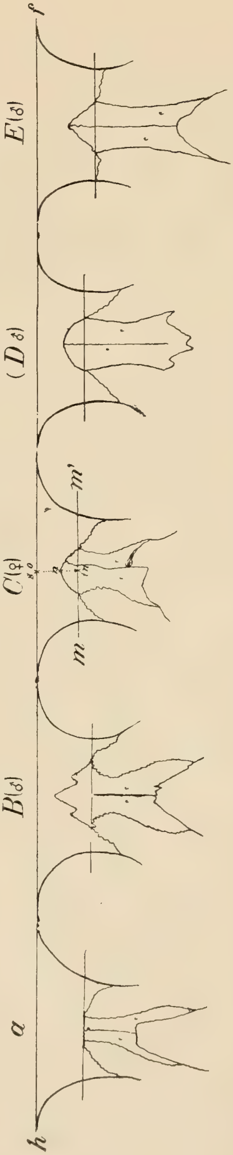


Fig. 17.—Pars nasalis of frontal bone in frontal projection and ear-eye orientation with nasion and infranasion points, in the Santa Barbara specimens. *a*, San Miguel Island, California (No. 318, M. A. I.); *h—f*, frontal line through *so*, supraorbitale; *m—m'*, frontal line through maxillo-naso-frontal points, on which lies *in*, infranasion; *n*, nasion. Dotted vertical *in—so* through *n*, corrective length line of pars nasalis. (About $\frac{2}{3}$ natural size.)

---

[1] Point of intersection between the crista lacrimalis anterior and the sutura maxillofrontalis.

in E. *Martin* (1914, 864–865) gives a physiological range of this measurement of 14–30 mm., and adds that the average interorbital width is greater in Europeans (21.7 mm. in the Swiss) than in Mongols, contrary to previous assumption. For a better understanding of the proportions of the nasal process, the width at its base was also measured and an index computed from the two width measurements. The basal width cannot be taken on a level with the supraorbital point for reasons which need not be discussed. The measuring points were rather found at the deepest recess of the supra-medial angle or curve of the orbit and which, with a little practice, can easily be ascertained. The basinasal width, then, amounts to 36 mm. in B, 32 mm. in C, 28 mm. in D, and 26 mm. in E. For comparison, the table on page 89 contains also the corresponding measurements in an Eskimo skull from Cape Nome and in that of the Brazilian Carijo already referred to, both belonging to our collection.

Both the Carijo and the Eskimo basinasal widths range below those of Santa Barbara specimens B and C, and as this is, at least in the Eskimo, likewise the case with the anterior interorbital width, the indices of these two quantities result accordingly. Thus, while the two Santa Barbara indices are almost alike, the Eskimo index of 53.3, lower than those, lends expression to the smaller, that of the Carijo, which is higher than any of the preceding, to the greater interorbital width and, at the same time, the smaller basinasal widths. The smaller basinasal widths of D and E likewise account for their higher indices, which in fact are the highest of our list.

HUMAN VARIETY	PROCESSUS NASALIS OSSIS FRONTIS				
	length		width		index
	nasion-supraorbitale mm.	infranasion-supraorbitale mm.	anterior interorbital mm.	basinasal mm.	$\frac{\text{max. front. width}\cdot 100}{\text{basinasal width}}$
Santa Barbara					
B (♂)	7	12	20	36	55.6
C (♀)	8	11	18	32	56.2
(D ♂)	6	10	21 (?)	28	75.0
E (♂)	7	12	18	26	69.3
Eskimo (Cape Nome) ♂	9	14	16	30	53.3
Carijo (Brazil) ♂	5	10	20	31	64.5

The important part which the nasal process of the frontal bone plays in the formation of the interorbital septum is also revealed by the fact that the length of the former is greater in primitive human varieties than in the modern recent ones (*P. and Fr. Sarasin* 1893, 229; *Fr. Sarasin* 1916–22, 214; *Zuckerkandl* 1877, 86). The bearing of both the length and width of the nasal process on the configuration of the orbit might be expressed by indices that bring those dimensions in proportion to the orbital height and the biorbital width (ektokonchion-ektokonchion). As regards the orbital height measurement, one would have to choose that which is at right angles with the orbital width measurement (maxillofrontale-ektokonchion), and not the vertical height, which does not account for the morphological peculiarity of the horizontally slanting orbita. It may not be superfluous to recall the fact that the supraorbital measuring point of the length of the nasal process coincides with that of the orbital height. The following table, in its first three numerical columns informs of the height proportions, and in its second three of the width proportions, between the nasal process and the orbita.

HUMAN VARIETY	PROCESSUS NASALIS AND ORBITA					
	1 infranasion-supraorbitale *mm.*	2 orbital height *mm.*	$\frac{1 \cdot 100}{2}$	3 anterior inter-orbital width *mm.*	4 biorbital width *mm.*	$\frac{3 \cdot 100}{4}$
Santa Barbara						
B (♂).......	12 (7)	34	35.3 (20.6)	20	102	19.6
C (♀).......	11 (8)	36	30.6 (22.2)	18	99	18.2
E (♂).......	12 (7)	36	33.3 (19.4)	18	98	18.4
Eskimo (Cape Nome) ♂.......	14 (9)	34	41.2 (26.5)	16	95	16.8
Carijo (Brazil) ♂..	10 (5)	33	30.3 (15.2)	20	95	21.1

The parenthesized figures of the first and third columns signify, in conjunction with the infranasion-supraorbitale length, the length with the nasion, and the indices in which it is involved. Considering that for the first proportion an index of 50.0 and above denotes that the nasal process reaches down to or below the level of horizontal halving of the orbit, all the indices fall short of that mark. On the other hand, it will be noticed that the greater lengths of the nasal processes give rise to the higher indices, as shown by Santa Barbara specimen B and the Eskimo skull. Similar conditions prevail in regard to the indices in parentheses: although the higher index among the Santa Barbara shifts to C, the Eskimo maintains its highest position. It will be easily recognized that the increasing differences between the infranasion and nasion lengths modify the indices in such a way as to be no longer illustrative of the true morphological conditions, which can lie only with the infranasion length. A comparison of the indices and of the factors involved in Santa Barbara skull C and the Carijo skull corroborates this statement.

With regard to the width index, the table shows its gradual decrease with the diminishing of both factors involved, or, from a general angle, the interorbito-biorbital index decreases with the diminishing biorbital width. If, however, a greater interorbital width combines itself with a relatively smaller biorbital width, the index assumes a higher figure, as shown by the Carijo, whose index of 21.1 exceeds the others noted in the table.

The orbital dimensions constituting the orbital index may be gathered from the table on page 92, in which, in order to facilitate comparison, the lacrimale width likewise is considered.

The difference between the two widths, amounting to 4 mm. and 2 mm. in the three Santa Barbara skulls, rarely surpasses the higher figure in any series of skulls. Their maxillofrontale widths of 41–43 mm. fall very

HUMAN VARIETY	ORBITA				
	width		3 height mm.	index	
	1.maxillo-frontale mm.	2.lacrimale mm.		$\frac{3\cdot 100}{1}$	$\frac{3\cdot 100}{2}$
Santa Barbara					
B (♂)........	43	39	34	79.1	87.2
C (♀)........	43	39	36	83.7	92.3
E (♂)........	41	39	36	87.8	92.3
Haida					
Averages ♂...	45.3 (42–50)	41.3 (38–45)	35.7 (33–39)	78.9 (70.0–86.4)	86.4 (76.5–95.2)
♀...	42.1 (39–44)	38.8 (36–40)	35.4 (32–38)	84.1 (76.2–92.3)	91.1 (82.3–100.0)
Koskimo					
Averages ♂...	45.1 (43–48)	40.5 (39–44)	39.2 (39–42)	85.9 (79.2–93.3)	96.6 (86.2–102.5)
♀...	43.2 (42–44)	39.0 (37–41)	38.7 (37–40)	89.6 (84.1–93.0)	99.0) (92.3–105.1)
La Chapelle-aux-Saints.........	—	Right 47.5 Left 46.5	Right 39.0 Left 38.0	—	81.9

low in the physiological range of that measurement as listed with the series in our table and which covers the values of 42–50 mm. The lacrimale width naturally yields similar results. The width averages of the Haida and Koskimo, although slightly in excess of our individual values, are nevertheless fairly uniform among themselves. This cannot be said regarding the orbital height, which is greatest in the Koskimo with their notoriously high orbits, and of which not only the Haida averages but likewise the Santa Barbara orbits fall short. The maxillofrontale index renders skulls B and C mesokonchial at 79.1 and 83.7, and E hypsikonchial at 87.8, while the three lacrimale indices are hypsikonchial at 87.2 for B, and 92.3 for both C and E. There seems to be indeed a tendency toward hypsikonchy in the Mongoloids, which is clearly shown even by the more conservative figures of the maxillofrontale index which renders both Koskimo averages hypsikonchial, while those of the Haida prove to be mesokonchial. Not so much by our individual Santa Barbara indices as by the averages of our table, it is shown that the female orbit is more hypsikonchial than the male and that on account of the higher orbit of the female in proportion to the width. This condition is fairly generally met with in all the human groups.

The orbital index (lacrimale) of La Chapelle-aux-Saints is mesokonchial, but near the border line toward chamækonchy (quoted by *Martin* 1914, 858). The considerable orbital height of 38 mm. is prompted there by a still more considerable orbital width of 46.5 mm., which bespeaks a very extensive orbital orifice, although the orbital index amounts only to 81.9, rendering it mesokonchial but quite close to chamækonchy.

In addition to the general descriptive marks of the orbit and their quantitative interpretation, it is the angular relation toward the three geometrical planes which is of great importance with respect to the configurative significance of the orbit in the facial complex.

The relations are those of the orbital width (maxillofrontale-ektokonchion) toward the frontal and horizontal planes passing through the maxillofrontale points, and that of the orbital height toward the horizontal

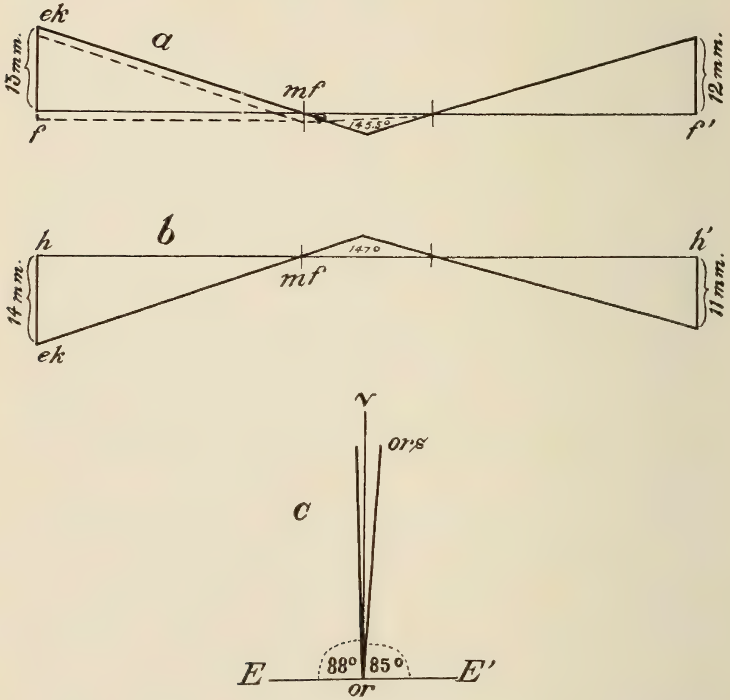


FIG. 18.—Scheme of (*a*) frontal, (*b*) horizontal, and (*c*) vertical orbital declination in ear-eye orientation of skull B(♂). *f—f'*, frontal and *h—h'*, horizontal plane line through *mf*, maxillofrontale; *ek*, ektokonchion; *E—E'*, ear-eye plane through *or*, orbitale; *ors*, orbitale superior; *or—v*, vertical plane line. ($\frac{2}{3}$ natural size.)

plane. It may not be superfluous to add that these three relations accounting for the frontal, horizontal, and sagittal declination of the orbit correspond to its declination in the vertical, frontal, and lateral aspects. The measurements were obtained by means of *H. Virchow's* (1915; 1918) "prosopometer," an ingeniously constructed instrument capable of the minutest application. The absolute measurements taken by this instrument from

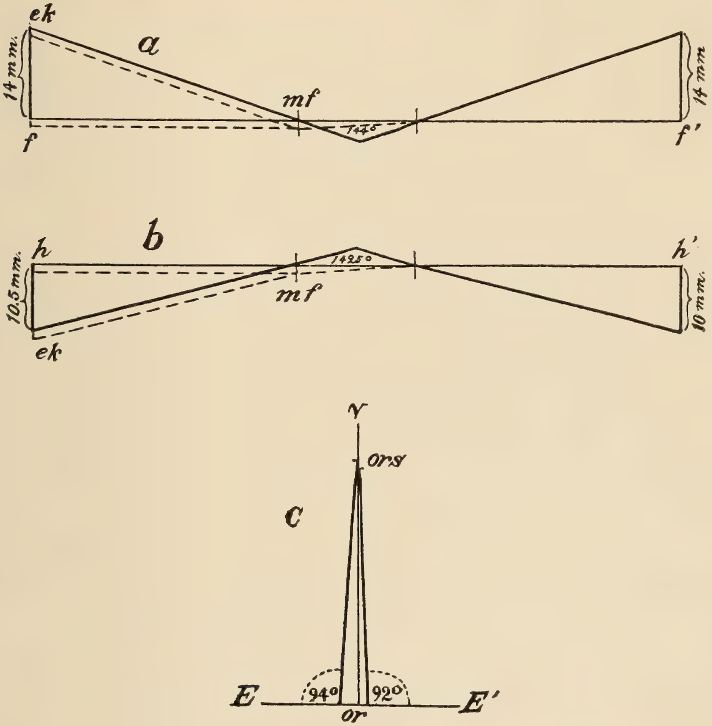


FIG. 19.—Scheme of orbital declinations of skull C (♀). The markings are as in fig. 18. (⅔ natural size)

the skull oriented in the ear-eye plane can easily be reproduced upon paper and, for the frontal and horizontal declination, projected upon lines representing the frontal and horizontal plane lines passing through the maxillofrontale points, while the vertical declination is referred to a line representing the ear-eye plane. Figs. 18–20, constructed in such manner, visualize the respective conditions in the Santa Barbara skulls, which are more precisely explained by the legends. However, it may here also be pointed out that the broken lines in the three sets of figures are in adjustment of differences of position in each pair of orbits which amount to 1 mm. as to the

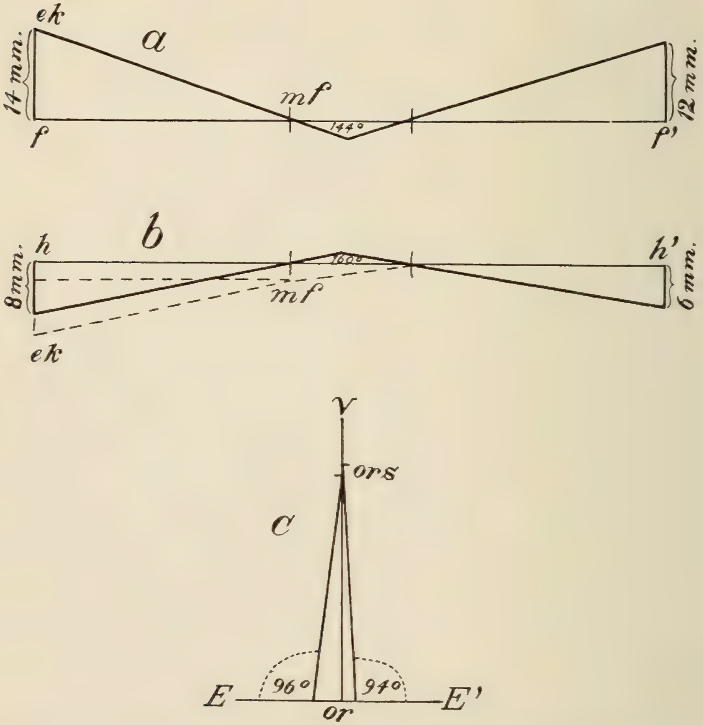


Fig. 20.—Scheme of orbital declinations of skull E (♂). The markings are as in fig. 18. (⅔ natural size)

frontal projection in both B and C, and likewise 1 mm. with reference to the horizontal orientation in C. The latter amounts to exactly 3 mm. in E, i.e., the right orbit lies in horizontal orientation 3 mm. below the level of the left. The subjoined table lists the three declinations (*a-c* of each figure) for each pair of orbits, and the average of each two. It will be seen that the findings for the two orbits are diverse in most cases. Comparing the averages, it is shown that the female skull at 19.0° exceeds in frontal declination the male skulls at 17.3° and 18.0°. Judging from *Martin's* (1914, 819) comparative table of averages, it appears that stronger deviations such as in the Swiss at 20.1° (16–28°) and in modern Europeans in general at 20.0° (16–24°), stand in opposition to those of the different Mongoloid peoples such as the Japanese at 14.2° (11–18°), the Kalmuck at 15.9° (9–23°), as well as in the Australian at 16.0° (14–20°). Our three skulls do not corroborate this disparity, but it must be remembered that they represent individual values which, as such, fall well within the Mongoloid ranges.

SPECIMEN	DECLINATION OF ORBIT								
	Frontal			Horizontal			Vertical		
	r.	l.	aver.	r.	l.	aver.	r.	l.	aver.
Santa Barbara									
B (♂).......	17.5°	17°	17.3°	18°	15°	16.5°	88°	85°	86.5°
C (♀).......	19°	19°	19.0°	15.5°	15°	15.3°	94°	92°	93.0°
E (♂).......	19°	17°	18.0°	12°	10°	11.0°	96°	94°	95.0°

The angle of horizontal declination is an expression of the fact that the human orbit slants more or less from medially and above to laterally and below. According to *Adachi* (cited by *Martin* 1914, 863), the angle under discussion is smaller in the Japanese and the Mongoloids than in Europeans, owing to the fact that the inferior lateral angle in the latter is drawn downward much more than in the former. Our angles amount to 16.5° in B, 15.3° in C, and 11° in E, thus preserving the proportions which as a rule obtain in the male and the female skulls. *Martin* (p. 863) gives averages for Europeans of 16.2° in males and 13.9° in females, while in the Japanese they are 13.8° and 11.9° respectively. In this particular case, then, our skulls B and C rather conform with the European averages, while E falls even below the male average for the Japanese.

As regards the vertical declination of the orbit, special investigations have shown that in general the angle in the male is greater than in the female, and that in Europeans it is greater than in the Mongoloids. Thus, while in the Mongoloids the angles average about 90°, Europeans (Swiss) are listed with 95.9° and 96° in the two sexes, and vary from 89° to 101°. Our skulls bear out this statement only in male B at an angle of 86.5°, while female C at 93° and male E at 95° are rather high, although falling well within the Mongoloid variation which *Reicher* (cited by *Martin* 1914, 818) gives from 81° to 101° for Telengets.

The nasal skeleton has already been mentioned in the discussion of the naso-frontal suture which separates the processus or pars nasalis of the frontal bone from the upper ends of the nasal bones (page 85). Both the latter joining in the sutura internasalis form the gabled roof of the nose, as shown by the midorbital horizontal tracings in ear-eye orientation of fig. 21, *a-e*. Our three specimens (*a-c*) show to an appreciable extent the angular projection in advance of the frontal plane line (*f-f′*) passing through the points of intersection with the nasomaxillary sutures. All three of them are considerably exceeded by a Swabian (American Museum of Natural History, no. 4555), while a Negro (same, no. 6958) falls markedly short of them. These instances serve to illustrate the conditions discussed, in three different races, although the ranges of individual variation may be quite wide at the same time.

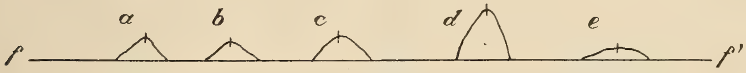


FIG. 21.—Midorbital outlines of nasal bones in cranial ear-eye orientation. *a—c*, Santa Barbara B (♂), C (♀), and E (♂); *d*, Swabian; *e*, Negro. *f—f′*, a frontal plane line coinciding with midorbital horizontal. (About $\frac{2}{3}$ natural size.)

Another morphological characteristic in the skull of the Mongoloid is the vertical concavity of the nasal bones and which is evenly and deeply curved in the Santa Barbara skulls, as demonstrated in fig. 22, *a-c*. The Chinook (no. 4470, American Museum of Natural History) tracing (*d*) shows a slight modification in so far as its lower portion swings outwardly into a mild convexity. The tracing in its entirety represents thus a double curve not too rarely found in the Chinook. Of moderate depth is the concavity of the Negro curve (*e*), and quite shallow that of the Swabian (*f*). However,

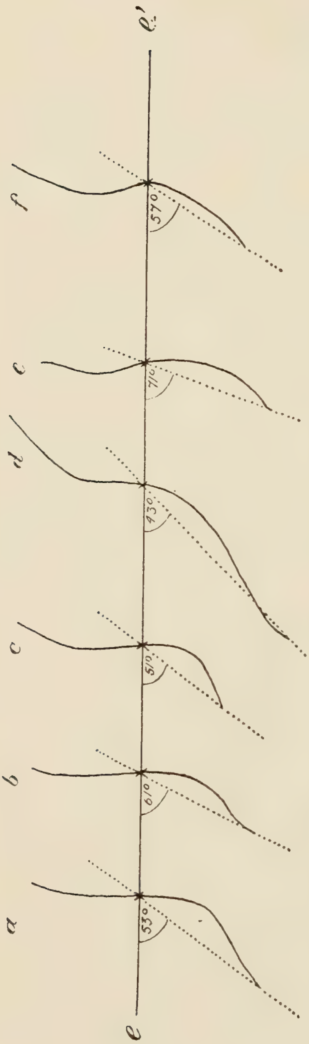


FIG. 22.—Vertical outlines of the nasal bones and angles of the nasal roof. *a*—*c*, Santa Barbara B(♂), C (♀), and E (♂); *d*, Chinook; *e*, Negro; *f*, Swabian. *e*—*e′*, parallel to ear-eye plane through nasion. ($\frac{3}{5}$ natural size.)

the point of distinction between the latter two tracings is their different projection as measured by the angle of the nasal roof between the nasion-rhinion line and the ear-eye parallel through the nasion. The shallowness of the Swabian outline is correlated with a stronger projection as expressed by a lesser angle of 57° as against 71° in the Negro and which in the latter illustrates the flatness of his nose. There is a much stronger projection at 43° to be noticed in the Chinook, and in line with the Swabian is that of the Santa Barbara specimens. But the difference lies with their degree of concavity, as has been pointed out above.[1] It is this feature, first of all, which furnishes the racial distinctions, but, second in importance, also the amount of projection. For the latter, *Martin* (1914, 814) gives a variation in Caucasoids from 43° to 65°, and in Mongoloids (Kalmucks, Torgotes, Chinese) from 56° to 76°.

---

[1] The total concavity of the nasal bones vertically is also noticed in the human fossils (*Homo mousteriensis*, Rhodesia).

The projection of the nasal contour (angle of the nasal roof) is in a way influenced by the profile line, and it is clear that a more prognathous face mitigates the impression of nasal projection. The angle between the nasal roof line and that of facial prognathism varies therefore between the Europeans and the more primitive groups. At a physiological range of from 1° to 47°, *Martin* (1914, 815) lists extreme group means of 34° for the Swiss and 12.1° for Negroes, while the Mongoloids maintain about medial stations. Such inferences cannot be fully justified by the Santa Barbara skulls at 24°, 19°, and 31°, which as such represent only individual values within generally quite extensive ranges of variation.

Coming now to the dimensions of the nasal aperture, it appears that within a general range of variation of 32–64 mm., the heights represent, with 53 mm. for B, 49 mm. for C, and 48 mm. for E, about medium conditions, which hold true likewise for the widths of 24 mm. and 26 mm. for B and C, and even 21 mm. for E, within the width variation extending from 17 mm. to 32 mm. The indices result accordingly, namely, leptorrhinic in B and E at 45.3 and 43.8, but chamærrhinic in C. While there is a general tendency toward broader noses in the peoples of Mongoloid derivation, except the Eskimo who are the classical representatives of leptorrhiny, there are on the other hand Indian groups with a tendency toward narrower noses. Our skulls B and E are examples of such.

There are no anomalies to be noticed in the nasal bones of our specimens, except that in C the two principal nasal foramina are situated in the lower halves, while as a rule they occur rather in the upper halves. The left one of C furthermore is removed toward the naso-maxillary suture. The nasal bones of C, as already mentioned in connection with the general state of preservation, are defective at their interior ends, but the right one is medially intact and afforded the complete vertical outline of the nasal roof. In D only the left nasal foramen is present; in E the right one is of normal size, while the left exists as a very tiny opening.

The nasal bones are of medium width and are constricted in their upper halves, the minimum width being 8 mm. in skulls B and C, and 9 mm. in D and E. Widening in their lower halves, they acquire maximum extensions of 16 mm. in B, 15 mm. in C, and 12 mm. each in D and E. The minimum and maximum widths give rise to the transverse index of the nasal bones, which is 50.0 in B and 53.3 in C, but 75.0 each in D and E, accounting here for smaller difference between the sizes of the two factors involved. In the former they are indicative of the "Sanduhr" (hourglass) shape of the nasal bones, which is typically pronounced in the Eskimo at an average of 33.7, while in Europeans the constriction becomes more equalized as expressed by indices, for instance, of the Parisians at 60.0 and Auvergnates at 62.7, rising even to 66.6 in La Chapelle-aux-Saints. The proportions of the nasal bones in the Anthropomorphæ are no less variable than those in the human skull. Their fundamental differences were clearly conceived by *Martin* (1914, 840) when he compared the constriction and the lower width of the nasal bones: "Relatively to the interorbital width the nasalia are less constricted in Hominidæ than in the Anthropomorphæ, while relatively to the width of the apertura piriformis their lower width is smaller, and their height is also considerably smaller."

Of interest in this connection also is the upper width of the nasal bones between the meeting points of the naso-frontal, maxillo-frontal, and naso-maxillary sutures. In a study of the naso-frontal suture in skulls from San Miguel island the writer (*Oetteking* 1920, 57) has referred to this measurement as the direct width of the naso-frontal suture between the "maxillo-naso-frontal" points (mnf). Bringing it in proportion to the anterior interorbital width, the indices in our skulls rise quite high with 75.0 in B, 66.7 in C and E, but lower at 57.1 in D. In the range of variation of the San Miguel skulls (35.0–87.5), the index of 57.1 falls below the male average of 61.6, while the other two exceed it. This applies likewise to the female C as compared with the San Miguel female average of 60.3. But they illustrate, furthermore, what was shown there in the comparative table (page 105), that there is a proportional interdependence between the anterior interorbital width and the upper width of the nasal bones.

The upper (maxillo-naso-frontal) and the maximum lower width of the nasal bones at a numerical proportion of 15 mm. to 16 mm. in B, 12 mm. to 15 mm. in C, and 12 mm. to 12 mm. in both D and E, give rise to indices of 93.8, 80, and 100. This index below 100 appears to signify the typical proportion between the two dimensions under discussion in the human skull, although there may occasionally be a coincidence between the two measurements or even an excess on the side of the upper width, which would raise the index to 100 or more.

The nasal measurements of the Santa Barbara skulls are combined in the table on page 105.

The nasal aperture is elegantly shaped in both skulls and the sides sharply edged. This holds true also for the lower incisures of the apertura piriformis in C, while those of B and E are less sharply marked. As the morphology of the lower notches depends on a number of intermediating factors, a short review of the conditions there may be proffered. The most significant detail here is the spina nasalis anterior, to a greater extent the result of the naso-alveolar flexion in the phylogenetic sense, the subsequent formation of the clivus nasoalveolaris, and as such best developed in Europeans. From the spina running backward and toward the concha nasalis inferior on each side, there is generally to be noticed a more or less sharply developed ridge, which has been variously named by different authors. We shall call it, with *Fr. Sarasin* (1916–22, 259), margo nasospinalis. The same author's margo nasoalveolaris corresponds to the lateral edges of the apertura piriformis themselves, which, turning medially, are (1) either lost upon the alveolar process of the maxillary bone before reaching the spina (infantile form), or, (2) reaching it, produce a more or less broad groove-like depression

NASAL MEASUREMENTS	SANTA BARBARA			
	B(♂)	C(♀)	(D♂)	E(♂)
	mm.	*mm.*	*mm.*	*mm.*
1. Absolute measurements:				
a. Anterior interorbital width (maxillofrontale width)...	20	18	21 (?)	18
b. Upper width of nasal bones (maxillo-naso-frontal width)..................	15	12	12	12
c. Minimum width of nasal bones....................	8	8	9	9
d. Maximum width of nasal bones....................	16	15	12	12
e. Nasal width................	24	26	—	21
f. Nasal height..............	53	49	—	48
2. Angles of nasal roof:				
g. Nasion-rhinion and ear-eye lines.....................	53°	61°	—	51°
h. Nasion-rhinion and nasion-prosthion lines............	24°	19°	—	31°
3. Indices:				
i. $\frac{b \cdot 100}{a}$	75.0	66.7	57.1	66.7
k. $\frac{b \cdot 100}{d}$	93.8	80.0	100.0	100.0
l. $\frac{c \cdot 100}{d}$	50.0	53.3	75.0	75.0
m. $\frac{e \cdot 100}{f}$	45.3	53.1	—	43.8

between the margines nasospinalis and nasoalveolaris (fossa prænasalis), or, (3) coinciding with the margo nasospinalis, cause the uniform, i.e., undifferentiated, sharp edge of the lower notches (anthropine form). There is a fourth form in which the rims of the nasal aperture continue rather straight upon the alveolar process, which results in broad sagittal (longitudinal) grooves whose bottoms are more or less continuous with the floor of the nose. This condition is considered truly pithecoid, but occurs also in the human varieties, most frequently in Oceanians and Negroes.

Our skulls differ quite markedly regarding the development of the spina nasalis anterior and the shape of the lower rim of the apertura piriformis. The former is well marked and projects horizontally in C and E, representing the oxyacanthic condition of *Macalister* (1898, 223–230), and which he characterizes as European. By the coinciding naso-spinal and naso-alveolar margines *Macalister's* oxycraspedotic form is produced. It is considered the true anthropine one, which, as a result of the pronounced flexion between the alveolar process and the floor of the nose, is to be considered an advanced morphological stage. In B, on the other hand, the spina projects only slightly and is illustrative of *Macalister's* lophacanthic condition as characteristic of the Mongoloid varieties. The halves of the spina as afforded by the two maxillary bones cleave in B, but give rise to well-marked margines nasospinales. The margines naso-alveolares are also distinct, but become less so on descending in a curved way and reaching the crista alveolaris media at about its middle. The nearly triangular field thus described on each side by the margines and the crista just mentioned is only slightly depressed, but nevertheless is fully recognizable rather as a clivus nasoalveolaris than as a fossa prænasalis.[1]

The pithecoid form of the lower rim of the apertura piriformis is very rare in Indians of the North Pacific Coast, among whom, in the undeformed skulls, it occurs in only 1.7%, while the oxycraspedotic or anthropine form shows a frequency of 21.2%, the amblycraspedotic or infantile one of 18.6%, while the majority of 58.4% is possessed of true fossæ prænasales. As regards the spina nasalis anterior, there is in that group a preponderance of the lophacanthic state at 53.3%, while only 6.7% represent the oxyacanthic, but 40.0% the kryptacanthic forms. Although quite variable in general, the two features under discussion assemble nevertheless the highest frequencies upon those forms which were recognized as particularly Mongoloid in character.

The regions lateral of the nasal aperture are distinguished by very shallow fossæ caninæ in B and E, while those in C are quite deep. The appearance of the anterior surface of the maxillary bones depends greatly upon its dimensions, particularly its height, the height of the alveolar process, the width of the zygomatic processes of the maxillary bone and that of the maxillary process of the zygomatic bone, and the curve described by the lower edge of the former, the so-called crista infrazygomatica (see *Rauber-Kopsch* 1919, v. II, p. 95). This curve can be very shallow, moderately deep, or deep. The first state is a reminiscence of primitive conditions as found in the anthropoid apes and in the fossil Hominidæ. It is here connected with an even anterior maxillary surface, the depression of it, the so-called fossa canina, being a condition which marks a more advanced morphological state. Involved in the latter are such factors as the progressive stages of naso-alveolar flexion, the narrowing of the face, and, in connection with it, the general refinement of the parts that participate in the facial complex. It is quite probable, and in a number of cases directly provable, that the processes of organic and structural economy are aided also by muscular traction in the production of modifications of morphological appearance. Thus, in the intensification of infrazygomatic curving may also be involved the functions of mm. masseter, zygomaticus and quadratus labii superioris. It is under the influence of these factors that the fossa canina is developed, although, as shown in C, it may exist at an appreciable depth in connection with a less deep curve of the crista infrazygomatica. The latter is more pronounced in B and shows at the same time more protruding (downward) tuberosities at the points of junction of the zygomatic and maxillary bones in the craniometrical points called zygomaxillaria. E also has a rather shallow infrazygomatic crest, which in this case coincides with a very shallow fossa canina. The infrazygomatic outlines of E and a Chukchee (no.

---

[1] The three conditions of the spina nasalis anterior distinguished by *Macalister* (1898, 223–230) are: oxyacanthic to characterize the European distinctly developed spina; lophacanthic, the Mongoloid blunt spina; and kryptacanthic, the negroid primitive one. The notches of the nasal aperture are either amblycraspedotic as representing the infantile two-lipped form; bothrocraspedotic, the fossa prænasalis; oxycraspedotic, the anthropine, sharp-edged; and oxygmocraspedotic, the pithecoid sulcus-like forms.

3848, American Museum of Natural History) are presented in fig. 23 to show the deep infrazygomatic curve in the latter and the shallow one in the former.

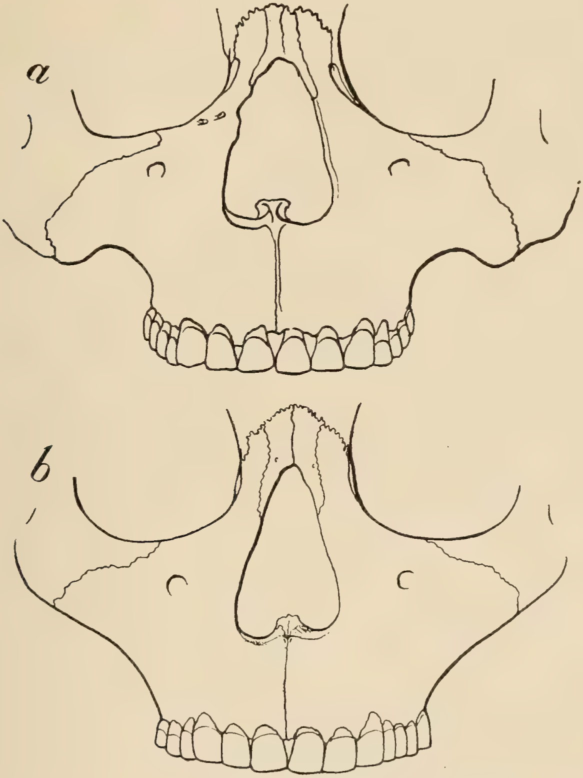


FIG. 23.—Two aspects of crista infrazygomatica: deeply curved in *a* (no. 3848, Chukchee ♂, A. M. N. H.), and very shallow in *b* (Santa Barbara E (♂). (About ⅔ natural size.)

The foramina infraorbitalia in the upper regions of the fossæ caninæ exceed medium size. Between the foramen infraorbitale and the lower orbital rim the sutura infraorbitalis is present on the left side of B and on both sides of C, but there is no indication of it in E. The orbital portion of the suture is also preserved in B. Well known as a typical feature in the Eskimo skull, it is occasionally found in other human varieties. Its frequency in the undeformed Indian skulls of the North Pacific Coast amounts even to 51.9% of bilateral and 2.9% of unilateral (left) occurrence.

As regards the position of the foramen infraorbitale in proportion to the height of the corpus maxillare, it must first be stated that both measurements differ as to right and left, and it is the latter which exceeds the former. The vertical height of the corpus (lower rim of orbit to alveolar border at middle of second premolar), as shown in the following table, is on the whole greater in B than in C and E, and in correlation therewith the distance is smaller between the upper rim of the foramen infraorbitale and the lower rim of the orbit.

CORPUS MAXILLARE	SANTA BARBARA					
	B(♂)		C(♀)		E(♂)	
	right	left	right	left	right	left
Height of corpus maxillare (mm.)	42	46	38	42	38	41
Height of foramen infraorbitale (mm.)	7	8	5	6	8	8
Index of position of foramen infraorbitale	16.7	17.4	13.2	14.5	21.1	19.5
Upper facial height (mm.)	72		69		67	
Upper facial index	54.6		53.1		50.0	
Maxillo-facial height index	61.1		59.4		58.9	

This correlation is perfectly clear in skulls B and C, but is not corroborated by E, whose maxillary height, fairly coinciding with the lower one of C, has a foramen height equaling that of B. The index of position of the foramen infraorbitale, according to the formula $\frac{\text{height of foramen infraorbitale} \cdot 100}{\text{height of corpus maxillare}}$, results accordingly in each case.

Another correlation is worthy of mention in this connection, namely, that between the height of the maxillary corpus and the general proportion of the face. According to *Martin* (1914, 823), in euryprosopic Swiss an average maxillary height of 38 mm. was observed, and in a leptoprosopic one of 44 mm. Similar correlations are likewise to be stated in the Santa Barbara crania, whose maxillary heights diminish with their upper facial heights, as may be seen in the preceding table. Here also the indices of the upper face height and that of the corpus maxillare bear out this correlation. Furthermore, although all three of our skulls are mesēnic, they nevertheless show different stages of mesēny in proportion to the quantitative differences.

For a general estimation and comparison of facial size and proportions, the averages and ranges of variation of undeformed skulls from the North Pacific Coast are presented in the table on page 112.

The upper facial height is seen to be quite variable in our three skulls. The two males B and E at 72 mm. and 67 mm. differ by 5 mm.; and between, at 69 mm., falls the female C. The latter, with 130 mm., stands lowest in bizygomatic breadth; but it is in this measure-

FACIAL MEASUREMENTS AND INDICES		SANTA BARBARA			NORTH PACIFIC COAST (UNDEFORMED SKULLS)	
					Averages and Variation	
		B(♂)	C(♀)	E(♂)	male	female
		mm.	*mm.*	*mm.*	*mm.*	*mm.*
1. Total facial height............		118	110	105	—	—
2. Upper facial height...........		72	69	67	75.0 (65–85)	70.2 (63–79)
3. Bizygomatic breadth..........		132	130	134	138.5 (125–156)	129.6 (117–140)
4. Cranial breadth..............		141	131	134	140.8 (129–152)	136.5 (130–150)
5. Minimum frontal width.......		96	90	85	94.1 (83–106)	91.4 (82–104)
6. Bigonial width (lower jaw)....		97	96	103	106.0 (85–117)	98.0 (86–110)
Indices:						
7. Facial:	$\frac{1 \cdot 100}{3}$	89.3	84.6	78.4	—	—
8. Upper facial:	$\frac{2 \cdot 100}{3}$	54.6	53.1	50.0	54.1 (41.4–61.8)	54.2 (49.6–61.0)
9. Transverse cranio-facial:	$\frac{3 \cdot 100}{4}$	93.6	99.2	100.0	98.5 (90.7–108.5)	95.3 (87.0–103.8)
10. Jugo-frontal:	$\frac{5 \cdot 100}{3}$	72.7	69.2	63.4	68.1 (59.7–77.2)	70.6 (64.0–84.5)
11. Jugo-mandibular:	$\frac{6 \cdot 100}{3}$	73.5	73.9	76.9	76.9 (67.8–85.1)	75.9 (69.9–85.8)

ment that E, with 134 mm., exceeds B at 132 mm. If the variation in the undeformed skulls of the North Pacific tribes be taken as an illustration of physical oscillation in general on the Pacific Coast, it will be noticed that the Santa Barbara male skulls fall in facial breadth and height below the average expressions, while the female fairly coincides with them. Our table contains also a number of other cranial measurements which have been discussed elsewhere in this report, and being brought in proportion to the facial measurements are discussed as indices farther below.

The proportion between the bizygomatic breadth and the facial height (nasion-gnathion) gives rise to indices which render B mesoprosopic with 89.3, but at the border line toward leptoprosopy, and C euryprosopic with 84.6, but in close proximity to mesoprosopy. E with 78.4, is hypereuryprosopic, owing rather to its relatively low total facial height than to its more conservative facial (bizygomatic) breadth. The upper facial index with the nasion-prosthion height is mesēnic, but in different degrees, and it is E which, with an index of 50.0, holds the line between mesēny and euryēny—a reminder of its hypereuryprosopic total facial index. Likewise in the upper facial index the variable facial height is of more decisive bearing than the less differing bizygomatic breadth. The upper facial indices of our specimens coincide with those of the North Pacific Coast Indians, whose averages may be considered as representing Mongoloid conditions in general.

The upper and lower facial breadths observed in the norma frontalis, i.e., the minimum frontal and the bigonial of the lower jaw, brought into proportion with the bizygomatic breadth, are expressed in the jugofrontal and jugo-mandibular index. As both breadth dimensions almost coincide in B, their indices coincide likewise with 72.7 and 73.5, thus indicating an equal upper and lower constriction of the facial aspect as against the zygomatic expansion. These conditions turn out differently in C on account of the bigonial breadth exceeding the minimum frontal by 6 mm., with the result of a jugo-frontal index of 69.2 and a jugo-mandibular one of 73.9. Similar proportions, only much more emphasized, obtain in E, on account of the minimum frontal width being reduced to 85 mm. and the bigonial breadth enhanced to 103 mm., with a difference of 18 mm. between the two. Its jugo-frontal index at 63.4 ranges therefore below, its jugo-mandibular index at 76.9 above, those of B and C. Diverging proportions obtain likewise between the two dimensions in the North Pacific Coast tribes of our table, and give rise to diverging indices in indication of a greater bigonial as against a smaller frontal breadth. This, however, seems to be the prevailing condition in all the human groups, the cause of which must be sought in phylogenetic processes of brain expansion bearing on the dimensions of the cranial base and lower jaw, as well as in functional adaptations in connection with mastication.

Of diagnostic interest also is the proportion between the facial and cranial breadth from which the transverse cranio-facial index is computed, and which reaches 93.6 in B, 99.2 in C, and 100 in E. The difference between the first one and the latter two, although all three are indicative of greater facial breadth, lies with the cranial breadth, which in C is 10 mm., and in E 7 mm., less than in B. In the series from the North Pacific Coast the male exceeds the female average. Although the variation is rather extensive with regard to this index, those under discussion nevertheless illustrate Mongoloid conditions. These can even exceed the mark of equality (100.0) of the two dimensions involved, with individual indices of 108.5 in the males and 103.8 in the females of the series of comparison of our table, and with an average of 100.8 in Eastern Eskimo (*Oetteking* 1908, 49), where an individual index of even 111.5 was observed. Although, then, the cranial breadth is of decisive influence in the outcome of the cranio-facial index, it is nevertheless the bizygomatic breadth which is of racial significance and which is absolutely as well as proportionately of conclusive importance.

Regarding the horizontal profilation of the face, it is the more frontal position of the maxillary process of the zygomatic bone and of the zygomatic process of the maxillary bone which results in what one is accustomed to term the high cheek of the Mongoloid face. Medially this condition is still further intensified by the behavior of the frontal process of the maxillary bone. The less anteriorly concave the latter is, and the smaller its angular deviation from the frontal plane, the more pronounced is the frontal orientation of the middle face. A further characteristic of the Mongoloid face is the sharp backward turn of the zygomatic bone by which two more or less distinct planes are produced, an anterior and a lateral one, while in the Caucasian and Negro skulls the lateral outline is more evenly rounded and considerably flatter. These racial modifications are shown in the tracings of fig. 24, which were taken upon skulls oriented in the ear-eye plane, upon the left side of the face slightly below the lower orbital rim in order to cover all the parts

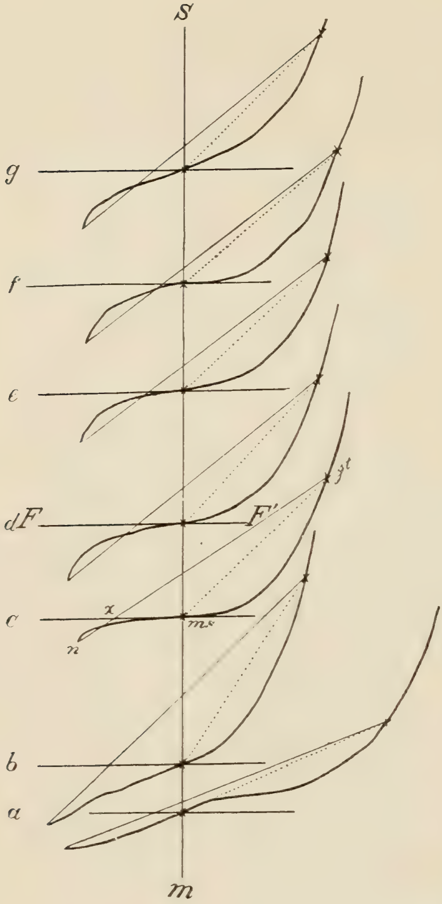


FIG. 24.—Midfacial horizontal outline of *a*, orang-utan; *b*, Negro; *c*, Nootka; *d—f*, Santa Barbara B (♂), C (♀), E (♂); *g*, Swabian. *m—s*, median-sagittal plane line intersecting in *ms* with frontal plane line *F—F′* which coincides with ear-eye plane; *n—zt*, nasozygomatic line (apertura piriformis to sutura zygomaticotemporalis) intersecting with *F—F′* line at point *x*. (½ natural size.)

from the nasal aperture to a point beyond the zygomatico-temporal suture. The lines of orientation are afforded by a parallel to the median-sagittal plane (*m-s*) intersecting with the zygomatico-maxillary suture of the outlines, which points were adjusted to it, and the frontal plane line (*F-F′*), at right angles to the former, and passing through the same points. There is still another line connecting the edge of the nasal aperture and the point of intersection with the zygomatico-temporal suture (*n-zt*), and which in a way helps to analyze the morphological complication there, as will be seen presently. For it is by this line that the appearance of the frontal process of the maxillary bone in horizontal cross-section may be judged. Its point of intersection with the *F-F′* line is marked *x* in our figure. The Nootka curve (fig. 24, *c*) as a prototype of the Mongoloid face shows its characteristics as pointed out above: the anterior portion almost coinciding with the frontal plane line, the sharp turn of the lateral outline, and the remarkably small deviation of the frontal process. These characteristics are only slightly modified in the Santa Barbara skulls (*d*, *e*, *f*). The concavity of the frontal process here is seen gradually to increase, simultaneous with its anterior aberration medially, while the zygomatic outlines remain true to the Mongoloid type. In the Swabian skull (*g*), the concavity of the frontal process is restricted to the medial half of its curve, while the lateral one is continuous with the zygomatic outline in its regular but little pronounced bulging. Quite different is the appearance of these parts in the Negro skull (*b*), and still more so in that of the orang-utan (*a*). Thus, while in the former the maxillary outline is practically straight and hardly set off against the zygomatic curve, the maxillary frontal process of the latter forms by its convexity a curve of itself which is continued into that of the zygomatic bone which then starts to form an individual curve. In connection with the conspicuous deviation of the maxillary outline in the Negro skull in advance of the frontal plane line, it must be pointed out that in the Negro skull it is rather an expression of pronounced vertical profilation of the Negro face. The zygomatic curve, as already mentioned, is least marked and flattest in the European where the naso-zygomatic line of orientation (*n-zt*) fairly resolves the entire tracing based on it into a medial concave portion and a larger lateral convex one. The gradual removal of the intersecting point of the naso-zygomatic and frontal plane lines from that of the latter and the median-sagittal plane line (*m-s*)[1] is quite an interesting feature in this connection, and is listed in figures in the next table, where it is accounted for as "naso-zygomatic deviation." It was for the sake of comparison with an anthropoid state that the facial outline of an orang-utan was added in fig. 24. The principal point of difference between it and the human facial outlines is the total convexity in advance of the naso-zygomatic line of orientation, which accounts for the distinctly frontally oriented face of the ape.

The projective width and length of the zygomatic curve, measured between the *ms* point and the *zt* point projected upon either the *m-s* or the *F-F′* line, the elevation of the curve above its chord, the length of the latter, and the indices derived therefrom, are listed in the table on page 119.

The projective widths and lengths do not differ greatly in the Swabian and the four Indian skulls, while the zygomatic width of the Negro falls short of them, and its length considerably exceeds them. This excess is due in part to the conspicuous medial deviation of the maxil-

---

[1] In the tracings of fig. 24 this point of intersection is marked *ms*. In analogy with the point marked *zt* it might have been called *zm* as signifying the two anatomical parts joining there. But since that symbol as zygomaxillare is used already for the lowest point of the zygo-maxillary suture, the symbol *ms* was resorted to in our tracings.

HUMAN VARIETY AND ORANG-UTAN	OS ZYGOMATICUM						
	1	2	3	4	5	Index	
		projective					
	naso-zygomatic deviation *ms–x** mm.	width *ms* to *zt* mm.	length *F–F'* to *zt* mm.	height of curve *ms–zt* mm.	length of chord *ms–zt* mm.	$\frac{3\cdot100}{2}$	$\frac{4\cdot100}{5}$
Swabian ♂	6	29	28	5	40	96.6	12.5
Santa Barbara							
E (♂)	4	32	27	8	42	84.4	19.1
C (♀)	7	30	27	7	41	90.0	17.1
B (♂)	9	28	29	7	41	103.6	17.1
Nootka ♂	14	30	28	8	42	93.3	19.1
Negro ♂	15	26	39	6	47	150.0	12.8
Orang-utan	6	42	18	5	46	41.9	10.9

* For markings compare fig. 24.

lary frontal process in advance of the frontal plane line, and which was pointed out before as in conformity with the profilation of the Negro face (page 117). The index computed from the projective zygomatic length and width, and expressing the latter in percentages of the former, is quite variable among our Indians and the European, in spite of the apparent slight disparity of the underlying factors. More marked, however, is the difference with the Negro, whose index of 150 expresses the strongly differing single dimensions and illustrates the morphological differences of the zygomatic bone in the facial configuration of the race. In opposition to them stands the orang-utan, with an index of only 41.9, which is the result not only of its extreme projective zygomatic width of 42 mm., but of its greatly reduced length of 18 mm.

The difference of horizontal extension or curvature of the zygomatic arc finds definite expression through an index which brings the elevation of the arc above its chord in proportion to the length of the latter. Again the lengths differ only slightly in the Swabian and the Indians. However, the Swabian chord length falls slightly lower in opposition to the Negro and orang-utan, which, with 47 mm. and 46 mm., outrange the others. More marked is the difference in the height of curve, exceeding in the Indians those of the other specimens, and aiding in the production of the higher indices that characterize the Mongoloid condition. The indices of the Swabian and Negro differ only by the lower decimal above the index unit 12, while the orang-utan's index is only 10.9.

Observing, finally, what was termed the naso-zygomatic deviation, as situated in fig. 24 between the points *ms* and *x*, it is seen to increase in our Indian skulls from 4 mm. to 14 mm., and to rise in proportion to the diminishing deviation, in advance of the frontal plane line, of those parts of our curves that trace the frontal processes of the maxillary bone. The Swabian, with 6 mm., falls within the variation of our Indian specimens, while the Negro exceeds them with 15 mm., and the orang-utan's deviation likewise amounts to only 6 mm., but the morphologically different conditions of the latter two find expression through other quantitative means discussed above.

NORMA OCCIPITALIS

The norma occipitalis offers less opportunity for morphological and metrical description than any of the other normæ. Starting with the delineation of the cranial contour, it corresponds in our three skulls to *Haberer's* (1898) "house shape." The sides are nearly vertical in projection, their greatest expansion occurring at the level of the temporal lines, or, still more precisely, *Dalla Rosa's* (1886) "circummuscular zone," where they turn rather sharply to form the cranial roof. The latter appears to be more rounded off in the female, while in the males a flat gable is formed. The somewhat irregular shape of E in the occipital aspect is due to its plagiocephalic cranial condition hinted at before (pages 12, 14, 22, 32). The shape and course of the sutures were discussed on pages 22–26. It may be pointed out that in C the interparietal apex of the occipital squama is somewhat dilated and squarish, while that of E is more acutely triangular. Observed quite frequently in a variety of shapes in the skulls from the North Pacific Coast, it was supposed there to represent an irregular ossification of the occipital fontanelle. The upper squama shows an even, almost globular, bulging, which continues only slightly interrupted into the lower squama, still better to be noticed in norma lateralis (pages 59, 60, 69). This condition conforms with those described by *Martin* (1905, 466) in the Senoi, and in both instances is due partly to the more erect orientation of the nuchal planum. The angle of the latter is discussed on page 59 of this work. The conditions described here are seen in outline in the median-sagittal curves (see pls. I–III), in which particularly the tracing of B represents an almost faultness segment of a circle. By this description it is already suggested that the occipital relief of the planum nuchale is rather weak The protuberantia occipitalis externa is very weakly developed, but there is a distinct indication of a torus occipitalis, more so in the males than in the female. A similar observation is that of *Koganei* (1906, 525) on Korean skulls where the torus occipitalis occurred eight times out of seventeen. Of these, seven cases were males and one a female. The transverse bulgings between the lineæ nuchæ superiores and supremæ were recognized in the undeformed skulls from the North Pacific Coast in different degrees of development at a frequency of 69.7%, although only in 0.8% in a pronounced form. The latter is a typical feature in the Neandertaloids, Australians, and certain Oceanians. But even the high occurrence in the American native population must be considered a racial characteristic. The foramina mastoidea are, as a rule, decidedly variable in size, number, and position, and are so in both our specimens. The left foramen in skull B is of medium size and is situated in its typical place in the occipito-mastoid suture. The right foramen, in size the same, is situated upon the mastoid portion of the temporal bone and removed about 5 mm. from the suture. The left foramen in skull C is in its regular place and is slightly above medium size. It is lacking on the right side, but perhaps is vicariously substituted by a smaller opening near the sutura parietomastoidea. On the left side in E there is a foramen of medium size on the mastoid portion of the temporal bone, while on the right side a tiny foramen in the corresponding part and another in the occipito-mastoidal suture are in evidence. Complete absence on one side is not so rare; such absence was observed in 5.2% on the right side and in 15.5% on the left side of the North Pacific undeformed skulls.

Regarding the principal dimensions observable in the norma occipitalis, the Santa Barbara skulls are slightly broader than high, as will be seen from the following table.

HUMAN VARIETY	CRANIAL BREADTH AND HEIGHT						
	breadth			height	indices		
	1	2	3	4			
	cranial *mm.*	biauricular *mm.*	mastoidal *mm.*	cranial *mm.*	$\frac{4 \cdot 100}{1}$	$\frac{2 \cdot 100}{1}$	$\frac{3 \cdot 100}{1}$
Santa Barbara							
B (♂).............	141	120	97	134	95.0	85.1	68.8
C (♀).............	131	118	97	125	95.4	90.1	74.1
E (♂).............	134	119	102	133	99.3	88.1	76.9
North Pacific Coast (undeformed)							
Averages ♂.............	140.8 (129–152)	—	—	134.2 (110–148)	95.5 (77.8–106.1)	—	—
Averages ♀.............	136.5 (130–150)	—	—	132.2 (115–141)	95.6 (83.3–106.3)	—	—

Presenting medium conditions in this respect, the breadth-height indices result accordingly. They are, with values of 95+, metriocranial in B and C, conditions typical of the Mongoloid and especially of the Indian skull. E, on the other hand, is acrocranial at 99.3, resulting from a smaller cranial breadth than that of B, but having a cranial height equal to it. The breadth-height indices of B and C are seen to conform exactly with those of the undeformed crania from the North Pacific Coast. The index of E, however, falls well into the range of variation. In further characterization of the cranial dimensions in the occipital aspect, the biauricular as well as the mastoidal breadths were recorded. The former differs by only 1 mm. each in our three skulls, while the latter is identical in both B and C, but is higher by 5 mm. in E. The two measurements as such differ in the typical way, i.e., the biauricular or breadth of the cranial base exceeds the mastoidal breadth. Sex differences in favor of the male skull are due naturally to the differences in size, and *Martin* (p. 717) claims that the two measurements differ more in brachycranial than in dolichocranial skulls. Each two indices derived from the latter two breadths in proportion to the cranial breadth differ in the Santa Barbara skulls on account of the difference in the latter measurement, which is even more noticeable in E.

LOWER JAW

The lower jaws are of medium size and are well balanced in their proportions. Muscle markings are somewhat more pronounced, although moderately developed in the males. This is likewise true of the lineæ obliquæ, which are steeper in the males, forming upon the corpus the familiar swelling and spreading into a vertical and longitudinal branch. About the lower border of the corpus of B and C is to be observed the planum platysmaticum ending anteriorly and laterally in the tubercula mentalia, also tubercula platysmatica according to *H. Virchow* (1920, 23). These conditions are merely indicated in C, while in E the striæ platysmaticæ (*H. Virchow* 1920, 5) are well marked. The basal border from fore to aft in lateral projection, particularly that of C, forms a continuous flatly convex outline without producing even an incisura præmasseterica (*M. v. Lenhossêk*, 1920, 53; also incisura præmuscularis *Klaatsch* 1909, 107, and incisura præangularis *Frizzi* 1910, 259) in its posterior portion. In the two males this incisure is only faintly indicated, as is another below the mental foramen, and here more so in E than in B, but in general the lower border is similar to that in the female. Characteristic of the outlines in lateral projection is the anterior height, exceeding only slightly that of the corpus in general, and which is due in part to the weak chin formation, all of these features repeating conditions prevailing in the American Indian, and, in a wider sense, the peoples of Mongoloid affinity.

The trigonum mentale is well developed in B and E, but weaker in C. The incisura subincisiva (*Klaatsch* 1909, 112), or incurvatio mandibulæ anterior (*H. Virchow* 1920, 62), is therefore quite shallow in C, but better marked in B and particularly in E. Laterally of the trigonum, the fossa mentalis (*H. Virchow* 1920, 62) and its continuation upon the corpus as sulcus mentalis (*Klaatsch* 1909, 112) are likewise better developed in B and E. It is remembered that the latter author (1909) has employed in connection with his alveolar plane line a chin vertical. The projection of the chin in advance, or falling short, of the vertical was termed by him positive, neutral, and negative chin. The misleading latter term occasioned *Frizzi's* (1910, 23) corrective vertical through the deepest point of the sub-incisival incurvation. It had to be employed in the median-sagittal tracing of C, which in *Klaatsch's* method would be possessed of a negative chin, while with *Frizzi's* corrective vertical the chin becomes positive. An angular expression of chin projection may be had by drawing the chin tangent from the incision (*Klaatsch* 1909, 103), or infradentale, or katoprosthion (*H. Virchow* 1920, 14), and touching the most anterior point of the chin (*v. Török's* "pogonion"). The angle formed by this tangent and the alveolar plane line is the one sought, but the present writer prefers the angle below the alveolar plane to the one used by *Puccioni* (1913, 6, 13) above that plane for the reason of more direct expressiveness. Reversing therefore *Puccioni's* classification of the "progonic" angle, the divisions would read thus:

Progonic	x – 89°
Orthogonic	90 – 100°
Opisthogonic	101 – x°

As indicated in fig. 25, a state of progony prevails in B and E, even quite pronounced in the latter at 73°, while C is orthogonic. This method is naturally applicable only for mandibles possessed of a chin and not for the chinless fossil men and apes. Slight projection of the chin must be recognized as truly Mongoloid, which is also the state of the American Indian, and in this respect B and C are more typical than E, although the range of variation is rather wide, as noticed in a more cursory survey of this feature.

Fig. 25 shows likewise the basal tracings in alveolar orientation of our three mandibles. They are well rounded and even narrow at that in C, while chin angles (tubercula mentalia s. platysmatica) are only slightly to be noted in E. They thus present *Klaatsch's* (1909, 113) "median chin" in contradistinction to his "lateral" one, for which *Frizzi* (1910, 24) substituted "round" and "squarish" (abgekantet). It may be said that the more roundish shape of chin in our

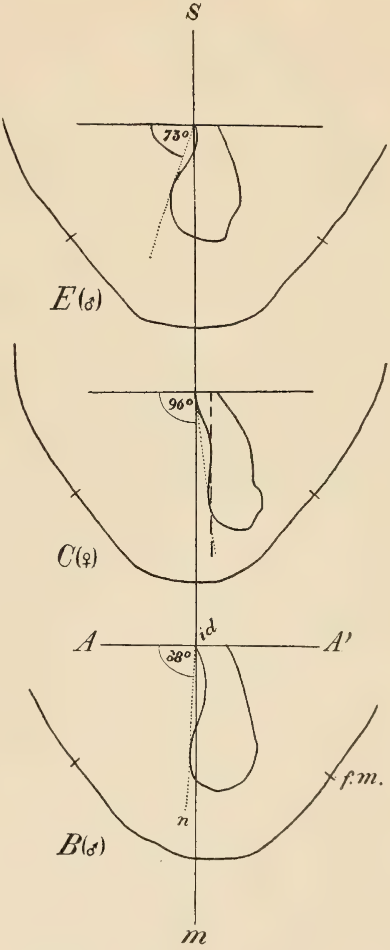


FIG. 25.—Basal and median-sagittal outlines of chin region in the Santa Barbara mandibles in alveolar orientation. *m—s*, median-sagittal; *A—A′*, alveolar plane; *id*, infradentale, *id—n*, chin tangent; ∠*A—id—n*, chin angle; *f.m.*, foramen mentale. ($\frac{1}{2}$ natural size.)

three specimens is likewise a true expression of rather typical conditions in the American Indians, although the opposite shape is also occasionally encountered among them.

The foramina mentalia, of which there are two on the left side of B and on the right side of E, are in line here, as well as in C, with the second premolars—in the latter, however, with the anterior alveolar rim, in the former, with the posterior. It seems that in the Anthropomorphæ, as well as in the Hominidæ, and certainly in the Australians, the situation of the mental foramina is rather in line with the first molar. This is doubtless a feature of phylogenetic significance, since with the progressive reduction of the alveolar process and the size of the teeth the foramina mentalia move automatically forward, or, better, retain their positions upon the more conservative corpus mandibulæ as against the modifying alveolar process.

The upper portion of the ramus is dilated in both C and E as compared with B, causing there the wider incisura mandibulæ, conditions which will be treated quantitatively below. The processus coronoidei are more pointed in the female, but in our three mandibles they fall short in height of the condyloid processes. They show on their medial sides well-developed ridges, *von Lenhossêk's* (1920, 51) cristæ endocoronoideæ. Another ridge, the crista endocondyloidea of the same author, branches from the former to form the medial edge of the condyloid process. Between the two cristæ the bone becomes thinner and often produces deep triangular depressions which are the rule in the lower jaw of the chimpanzee and occur with some frequency in man too They are wanting, however, in our specimens. This was called by *Klaatsch* (1908, 93) fossa subcoronoidea, and was supposed by him to be a muscular groove. But as it is a place particularly free from muscular insertion, and situated not below but back of the processus coronoideus, it might as well be termed "fossa (or trigonum) postcoronoideum." The longitudinal groove at the anterior border of the ascending ramus, *Klaatsch's* (1909, 108) fossa præcoronoidea, is deeper in B than in C and E, and its width is of medium proportions. Its lower portion in connecton with the postmolar space or trigonum postmolare (*Klaatsch* 1909, 108) presents, as a rule, the greatest thickness of the mandible. The respective measurements are 16 mm. in B, 18 mm. in C, and 14 mm. in E, as compared with 23.5 mm. in the Heidelberg jaw.

Medially the three mandibles are quite spacious and well rounded out in their anterior portions. The spina mentalis interna, or, better, the spinæ genioglossi, are individually well developed in B, but are merely indicated in C and E. The insertion of the mm. geniohyoidei is marked in proportion by tuberosities. Just above these formations there is a deeper funnel-like depression with an opening at the bottom in C, the outlet of a canalis medianus Bertelli. The fossæ digastricæ slope backward, indicating an advanced morphological condition as against those in the fossils where the area digastrica is directed downward. In our three specimens the two fossæ are medially separated by a distinct spina interdigastrica. The mylohyoid line, or rather angle, is well developed, particularly in B and C, and this seems to be the rule in the Indian lower jaw. It is even more projecting in the female, where likewise the postmolar width was shown slightly in excess of that of the males.

The condyloid processes are well rounded above and show no signs of flattening wear such as is usual in middle age. In vertical view they are elliptic with tapering ends, medially even more so than laterally. The frequently occurring and slightly pointed projection at the anterior edge of the mandibular condyles, which is brought about partly by the molding influence of ligaments and muscles (capsula articularis, ligamentum temporomandibulare, m. pterygoideus externus), is not present in our specimens. The antero-posterior diameter of the condyles which, according to *Martin* (1914, 881), amounts in the adult in most cases to a third of the length of the transverse diameter of the condyles, comes in the Santa Barbara mandibles to about its half. The length-breadth index of the capitulum therefore lies around 50, within a general range of 23–72 (p. 881), which is higher than the human average of 38.1. However, *Martin* states that about 90% of all cases occur between the index values of 30 and 50. The following table of capitulum measurements contains also a few comparative data of which those of La Chapelle-aux-Saints are distinguished by unusual proportions.

The axes of the condyles are in general quite variable and subject to the configurative formation at the cranial basis. The axes are directed from medially and backward to laterally and forward, which is likewise the condition here. The angles formed by the two condylar axes are greater in B and E than in C, corresponding thus to the nearly frontal direction of the fossæ mandibulares there, as referred to on page 74. The condylar angles are also listed in the table.

HUMAN VARIETIES AND ANTHROPOIDS	CAPITULUM MANDIBULÆ						
	length		breadth		breadth·100 / length		angle of condylar axes
	r. *mm.*	l. *mm.*	r. *mm.*	l. *mm.*	r.	l.	
Santa Barbara							
B (♂)	21	20.5	10	10	47.6	48.8	154°
C (♀)	19	20	10	10	52.7	50.0	140°
E (♂)	22	22.5	12	11	54.4	48.9	158°
Homo*	—		—		38.1 (23–72)		148°
Chimpanzee*	—		—		46.1		—
Orang-utan*	—		—		75.0		—
La Chapelle-aux-Saints*	29		13.5		46.6		—

**Martin* 1914, 881.

A word may be said regarding the mutual behavior of the processus alveolaris and the ramus. It appears that during phylogenetic development and with the broadening out of the skull base, the condyles, as well as the coronoid processes into which the temporal muscles are inserted, develop and broaden similarly, producing the downward and mesially slanting position of the ramus. Without changing the general status, this at times is counteracted by muscular traction that causes the eversion of the anguli mandibulæ, which as a feature by itself is very pronounced in the gorilla. But the most remarkable change takes place between the posterior end of the alveolar process and the anterior border of the ramus below the coronoid process, causing that deep recess, the fossa præcoronoidea. It shows the alveolar process to be the more conservative element, and the fossa, which is already well marked in the anthropoids, subject to the degree of ramus deviation.

The foveæ submaxillares, as well as the sublinguales, are quite pronounced in C. The sulci mylohyoidei and the foramina mandibularia are of normal appearance, except that the left sulcus in C is bridged, and both sulci are doubly bridged in E, with outlets at the lower end.

The principal measurements of the Santa Barbara mandibles are combined in the table on page 134, where for comparison several other groups, as well as the Heidelberg specimen, are included. In conjunction with this table and those following, the lateral outlines of our three mandibles in alveolar orientation should be consulted. The central of the three outlines of fig. 26 shows the measurements and angles referred to in the text.

The dimensions listed in our table for the lower jaws of B and C are nearly identical, while the length of E falls short of, and the two widths exceed, the corresponding measurements. According to the physiological ranges given by *Martin* (1914, 870) for the three measurements extending for the length from 90 mm. to 126 mm., the bicondylar width from 103 mm. to 135 mm., and the bigonial width from 85 mm. to 117 mm.,

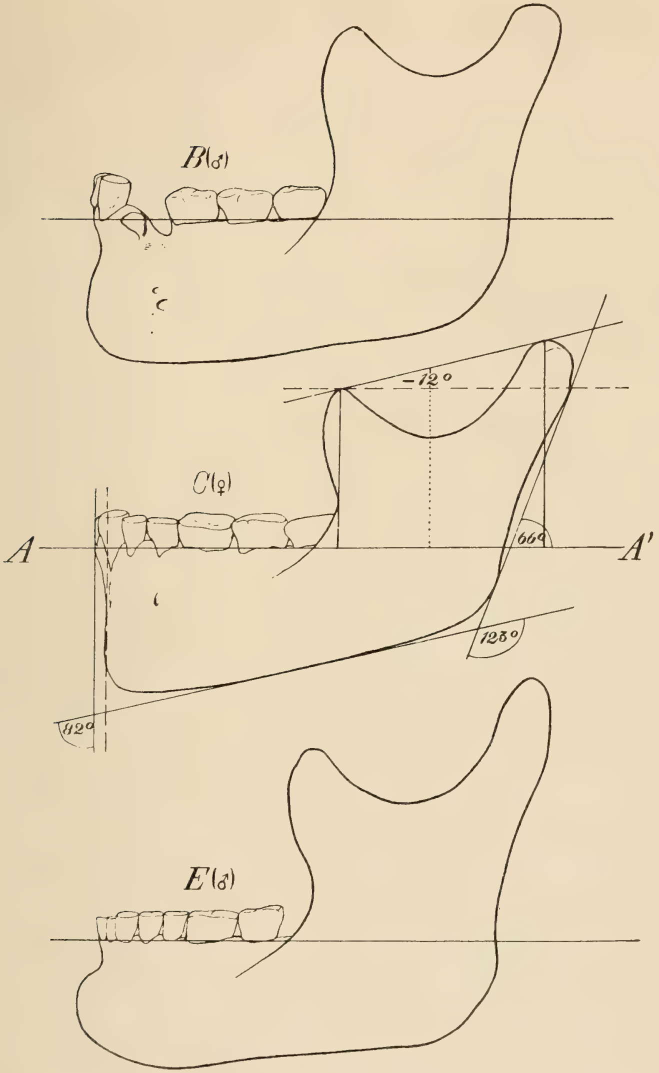


Fig. 26.—Lateral outlines in orthogonal projection and alveolar orientation of the Santa Barbara mandibles. *A—A′*, alveolar plane line. For angles and methods see text. (½ natural size.)

HUMAN VARIETY		PRINCIPAL MEASUREMENTS AND INDICES OF THE MANDIBLE				
		1	2	3	Index	
		length mm.	bicondylar width mm.	bigonial width mm.	$\frac{1 \cdot 100}{2}$	$\frac{3 \cdot 100}{2}$
Santa Barbara						
	B (♂)	107*	117	97	90.6	82.9
	C (♀)	109	118	96	90.6	81.3
	E (♂)	99	120	102	82.5	85.0
Averages	Chinese†	102	120	101	98.5	83.7
	Negroes†	106	112	93	87.9	83.1
	Australians†	112	122	103	92.3	84.4
Heidelberg		120	131	110	91.7	84.0

* The length of the mandible is measured from the chin projection to the most posterior points of extension, the jaw resting on its base. The points of posterior projection are the backs of the condyles (*Martin* 1914, 559, measurement 68). However, since through the introduction of the alveolar plane line (*Klaatsch* 1909) we possess a means of proper mandibular orientation, the length (mento-condylar) might just as well be adjusted to it. In further justification of such procedure is the outstanding fact that the mandibular orientation coincides with the general cranial ear-eye orientation much more frequently than the fortuitous one of its former by its basal border. Although the alveolar plane has been utilized extensively in the present studies, the mandibular length was not referred to it in order to facilitate comparison, but may nevertheless be mentioned separately in this note. The mento-condylar lengths then,—the one taken in the usual way and that secured in alveolar orientation,— are in B as 107 mm. to 103 mm., in C as 109 mm. to 103 mm., and in E as 99 mm. to 96 mm.

† *Martin* 1914, 869.

our mandibles represent about medium conditions in B and C, while for E here holds good what has been said about it in the preceding sentence. The length averages listed for comparison in our table are graded in such a way that the Negroes with 106 mm. exceed the Chinese with 102 mm., while both in turn are exceeded by the Australians with 112 mm. Comparing the Chinese averages of the two width measurements taken as a standard for peoples of Mongoloid affinity, it will be seen that the Santa Barbara mandibles fairly approximate them as representing medium conditions, while the Negroes range below and the Australians above them. The length-width indices of our specimens are strongly influenced by the relative shortness of their lengths, especially in E, i.e., they range below the averages of the other varieties except the Negroes, while the high index of the Chinese is not entirely plausible from the average dimensions involved.

The width indices are more stable in general, amounting to 81.3 in C and 82.9 in B, and accounting in the former for a slightly greater bicondylar and a slightly smaller bigonial width. The higher index of 85.0 in E results, of course, rather from its markedly greater bigonial than its only slightly greater bicondylar width. Regarding the Heidelberg jaw, it is its exceedingly large dimensions which mark it as the largest specimen on record, while its indices conform with those of the Australians.

The height proportions of the body were determined by *Cameron* (1923, 54 c) by an index involving the symphysial and molar heights, the former being measured, like the chin height, between the lower border of the chin and the interalveolar septum of the middle incisor teeth, the latter between the second and third molars. *Cameron* observed the anterior height of jaw in the adult Western and Central Eskimo greatly to exceed in cases that of the molar region. The lowest index as expressing the greatest divergence between the two heights was that of an adult female at 62.1, while an adolescent female had an index of 91.4. He compares the adult index with the European variation of 76.1–94.1, concluding "that the masticatory activity, and therefore the downward pressure upon the lower molar series, were not merely so evident in these types of mankind" (p. 54 c). It seems doubtful to the present writer whether the depressed molar height of the corpus is a result of function, since the principal demands on the masticatory apparatus occur during a period of concluded growth when such radical changes in a bone as alluded to are hardly imaginable. He is confirmed in his deviating opinion by the examination of an Eskimo mandible from Smith sound (American Museum of Natural History, no. 105) of extraordinary massiveness. Its two corpus heights are as 37 mm. to 30 mm., giving rise to the high index of 81.1.

Our two mandibles B and C have chin heights of 33 mm. each, and molar heights of 29 mm. and 25 mm. respectively, resulting in indices of 85.5 in B and 75.8 in C. With a chin height of 27 mm. and a molar height of 28 mm., the conditions are reversed in E. The index here amounts to 103.7, thus exceeding *Cameron's* European range. The smaller chin height of our specimen E is due to an incurvation of the basal border of the chin, *Klaatsch's* (1909, 110) incisura submentalis, which is absent in C and only slightly indicated in B. The last named author sees in it an inferior character existing in the Gibbon and the mandibles of old diluvial origin, and only as a reminiscence of those conditions encountered in more recent varieties.

It is to *Cameron's* credit that he has called renewed attention to a faint groove medially right below the third molar tooth, which is there caused by nervus lingualis (p. c 55). Not of constant occurrence in general, it is nevertheless very pronounced in our specimen C.

In order to express by an index the dimensions of the ramus, *Cameron* (p. c 55) has brought into proportion its minimum breadth, and, at right angles with it, the height from the bottom of the sigmoid notch (incisura mandibulæ) to the lower border of the corpus. Admitting that the height measurement of the ramus as usually taken between the condyle and the angle (condylion to gonion) is a rather arbitrary one, the writer fails to see the advantage of the substitution of the no less variable sigmoid height without accounting for the coronoid and condylar processes which are integral parts of the ramus. He therefore would prefer that the ramus height be taken with the inclusion of the two processes easily to be connected by a string or a needle, and above the deepest point of the curve. The accompanying table shows our two mandibles B and C to be possessed of equal ramus breadths of 35 mm., E exceeding them by 2 mm. The difference between the sigmoid and condylo-coronoid heights is, in favor of the latter, seen gradually ascending and amounting to 13 mm., 15 mm., and 18 mm. in our three mandibles and signifying a differing depth of the incisura mandibulæ. They differ also between themselves in such a way that the heights of C fall between those of B and E. The index with the sigmoid height, *Cameron's* "index of width of the ramus" (p. c 55), is at 79.5 higher in C than in B and E, owing to its

HUMAN VARIETY AND CHIMPANZEE	RAMUS MANDIBULÆ				
	1	2	3	Indices	
	minimum breadth mm.	sigmoid height* mm.	condylo coronoid height mm.	$\frac{1\cdot100}{2}$	$\frac{1\cdot100}{3}$
Santa Barbara					
B (♂)	35	53	66	66.0	53.0
C (♀)	35	44	59	79.5	59.3
E (♂)	37	51	69	72.5	53.6
Western and Central Eskimo†					
♂ (7)	41.5	50.3	—	82.2	—
♀ (4)	35.1	49.4	—	71.0	—
Anglo-Saxons† (10)	—	—	—	52.3 to 67.8	—
Chimpanzee‡	50	58	68	86.2	73.5

---

* The description of measurements 2 and 3 is given in the text.

† *Cameron* 1923.

‡ Amer. Mus. Nat. Hist., 51377.

lower ramus height at about equal breadths. The condylo-coronoid heights influence the indices, of course, to the amount of the height differences. The Eskimo of the last table, at least in the males, have broader and lower rami, as compared with the Santa Barbara specimens, and hence a markedly higher index. The females range with slender rami below the males. Decidedly lower indices are characteristic of the Anglo-Saxons, with perhaps an average around 60.0, or even lower, in expression of much slimmer rami. *Cameron* (p. c 55) remarks on the highly interesting observation that the index "increased with age in both sexes, up to middle life at any rate," owing to the increasing width of the index, while "in European types of mandible, it was ascertained that the index of width of the ramus increased with age so long as the teeth remained intact, and then diminished again if the individual became edentulous."

For comparison the corresponding measurements of a chimpanzee are included in the table. They exceed those of the human varieties considerably, yielding also indices in excess of them.

Since the establishment by *Klaatsch* of a plane of orientation, quite a number of the absolute measurements of the mandible may be referred to it.[1] Thus, the ramus measurements are easily ascertained. The mutual relation between the coronoid and condyloid heights above the alveolar plane might be expressed by an index according to the formula: $\frac{\text{condylar height} \cdot 100}{\text{coronoid height}}$[1]. The Santa Barbara specimens are distinguished by lower coronoid processes; they are chamæcoronic with indices of 105.0 in B, 122.6 in C, and 129.7 in E. *Puccioni* (p. 300) classifies the American Indian as hypsicoronic, i.e., with indices up to 94.5. His statement refers, of course, to average conditions, as likewise does the following: "Les mandibules chamæcorones ne se trouvent pas chez les hommes: la mâchoire inférieure de Mauer est la seule qui offre un indice rentrant dans ce groupe." Our two mandibles C and E, however, fall within the chamæcoronic range, while B, isocoronic at 105.0, is not far removed from the chamæcoronic.

---

[1] Slightly modifying the technique proposed by *Klaatsch* (1909, 102–103) and *H. Virchow* (1920, 14), the writer passes his alveolar plane line through points upon the thickened seam all around the alveolar process and which is rarely missing, between the middle incisors and at the alveolus for m_3. He believes to have thus found more constant points of orientation as compared with those required by the two authors named.

The depth of the incisura mandibulæ (s. condylocoronoidea), which varies in the human varieties from 10 mm. to 18 mm. (*Martin* 1914, 881), presents with 12 mm. in B, 13 mm. in C, and 16 mm. in E, varying conditions in the Santa Barbara specimens. Greater differences were noted for the condylo-coronoid width. Measuring 35 mm. in B, it reaches 42 mm. in C and E, and represents in the latter a kind of a "dilation" of the

---

[1] It is clear that the coronoid process may be either higher, lower, or at an equal height with the condyloid process. *Puccioni* (1914, 300) classifies the index according to the following terms, which explain themselves:

hypsicoronic	x– 94.5
isocoronic	94.6–106.5
chamæcoronic	106.6–x

two processes, which seems to be more frequent in the female mandible.

The indices derived from these measurements are, with 34.3 in B, 31.0 in C, and 38.1 in E, microbathycœlomic in B and C, but macrobathycœlomic in E, according to *Puccioni's* (1914, 303) classification.[1] In spite of its greater depth, the lower index in C is due to the markedly greater width, which in fact appears to be the more variable factor, not only in the Indian mandible, but in the Mongoloid in general. The index of E, on the other hand, is expressive of a greater incisura depth.

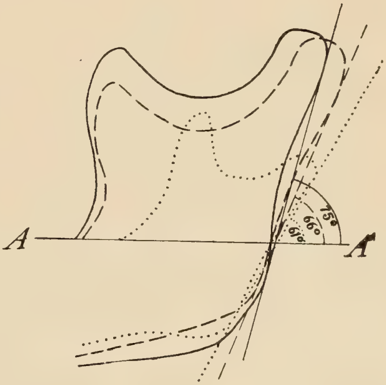


FIG. 27.—Superposition of mandibular rami in lateral projection and alveolar orientation, to show differences of ramus angles. *A—A'*, alveolar plane. ——— Santa Barbara B (♂); ----- Santa Barbara C (♀); .... Ozan, Arkansas (no. 543 inf., M. A. I.). (½ natural size.)

The alveolar plane line is of greatest importance in angular investigation. The following table contains in alveolar orientation (1) the condylo-coronoid angle between the condylo-coronoid tangent and a parallel of the alveolar plane line, (2) the ramus angle between the ramus tangent and the alveolar plane line, (3) the "postero-basal" (mihi) angle between the ramus and basal tangents, and (4)

---

[1] Incisura index:

microbathycœlomic	x–37.0
macrobathycœlomic	37.1–x

the "antero-basal" (mihi) angle between the chin vertical and the basal tangent. They may be read also from the lateral projections of fig. 26 (middle figure).

HUMAN VARIETY	MANDIBULAR ANGLES IN ALVEOLAR ORIENTATION			
	condylo-coronoid	ramus	postero-basal	antero-basal
Santa Barbara				
B (♂)......	−7°	75°	115°	81°
C (♀)......	−12°	66°	123°	82°
E (♂)......	−18°	77°	109°	85°
North Pacific coast (undeformed)				
Averages ♂..	+0.4° (−18 to +18°)	69.0° (55–79°)	118.4° (100–137°)	81.8° (69–89°)
♀..	−1.4° (−12 to +12°)	64.2° (57–70°)	124.2° (116–131°)	80.5° (72–86°)
European*........	−10°	77°	112°	78°
Negro*...........	+20°	70°	128°	71°
Australian*.......	−12°	83°	116°	72°
Dajak*...........	+7°	75°	108°	88°

* Single jaws (*Klaatsch* 1909).

Before the introduction of the alveolar plane of mandibular orientation, the means of determining the exact state of erectness or declination of the ramus were wanting. The ramus angles on that plane for the Santa Barbara specimens are 75° in B, 66° in C, and 77° in E. The female angle (C ♀) is thus seen to range below the male angles. The average ramus angles of the undeformed crania from the North Pacific Coast, at 69.0° and 64.2° in the two sexes, also show the female angle to be smaller than that of the male, or, what is equivalent, signifies the more marked declination of the female ramus. This fact being established there, it was shown by further comparison that the infantile ramus angle fell short of the angle in both the male and the female, the cause for it, of course, lying with the processes of growth and function. In order to show the different degrees of declination, the ramus outlines in lateral projection of Santa Barbara specimens B and C are superposed in fig. 27, together with an outline of an infantile mandible from Ozan, Arkansas (no. 543 of our collection). They were made to coincide at the points of intersection between the ramus tangents and the alveolar plane line. The other ramus angles of our table show a remarkable degree of erectness at 83° in an Australian, followed by a European at 77°, a Dajak at 75°, and an African Negro at 70°. However, their figures, like those of the Santa Barbara mandibles, are only of relative comparative value, as they represent only individual ones. Taking the ranges of variation of the North Pacific Coast as a criterion, it will nevertheless be realized that our two specimens hold high stations there and that the Australian at 83° even exceeds the ranges.

In close relation to the ramus angle, but conditioned by the behavior of the basal tangent, the postero-basal angle is, in a way, the equivalent of and comparable with the older ramus angle. In spite of the variation of that tangent, the sex difference is well pronounced in the individual figures of the Santa Barbara specimens, as well as in those of the North Pacific Coast. They are in favor of the female angle and correlated with the greater female ramus angles first discussed. The angles of B and C fairly correspond with those of the North Pacific specimens, while E falls noticeably short of them on account of its more erect ramus tangent. The individual figures of our column are quite variable, owing doubtless to the varying conditions regarding the basal tangent. These may best be judged from the ranges of the antero-basal angle between the basal tangent and the chin vertical. Sex differences of this angle seem to favor the males, who have a slightly higher average.

For the postero-basal, or the ramus angle of the older method, *Martin* (1914, 884) gives an adult range of 88–142°, and *Kieffer's* (1908) averages for Peruvians and Chinese at 119°, Australians at 124°, Negroes at 125°, and Europeans at 128°. The latter author showed that it was the differing chin heights that bore decidedly on the outcome of the angle.

The condylo-coronoid deviation has been expressed by the condylo-coronoid index (see pages 139–140). The more exact method, however, seems to be the determination of the angle of deviation of the "condylo-coronoid tangent" (*Klaatsch* 1909, 107) from intersecting lines. Thus *Klaatsch* determined such an angle by the intersection of the condylo-coronoid and ramus tangents. However, both being variable quantities, this method lacks definiteness. *Puccioni* (1913, 7) determines the angle in relation to a line at right angles with the alveolar plane line, which he erects as a tangent to the anterior border of the ramus. The angle opens forward and is named by *Puccioni* "angolo anteriore della branca," the justification of which is not quite clear, since it is the deviation of the condylo-coronoid tangent which is to be expressed by it. To the present writer the simplest and most unequivocal method seems to be the direct determination of the angle upon a parallel to the alveolar plane line passing through the coronion. It is a plus angle (+) if the condylo-coronoid tangent slopes backward, and a minus one (−) if it slopes forward.

The required lines can easily be drawn into the craniogram (mandibulogram), since a suitable apparatus for direct measurements is not yet available. The angle itself is one of great variability. In the North Pacific mandibles, as will be seen from the table, it extends from −18° to +18° in the males and from −12° to +12° in the females, with averages of +0.4° and −1.4° in the two sexes. The Santa Barbara mandibles, with −7° in B, −12° in C, and −18° in E, decidedly emphasize the minus state. Of some significance is the single value of +20° in the Negro, which exceeds the plus side of the North Pacific range of variation. It will remain for a later period of multiplied studies in this new method to produce more comprehensively differentiated results. *Puccioni's* assertion of the predominant state of hypsicorony in the American Indian can not very well be upheld on the basis of our own results, at least for the Santa Barbara specimens and the North Pacific tribes. His statement as based on his index classification (see page 140) is neither prompted by the Santa Barbara indices as listed there nor by the condylo-coronoid angles which likewise suggest a chamæcoronic state, while the average angles of the mandibles of the undeformed crania from the North Pacific Coast suggest absolute isocorony. The range of variation here is nevertheless quite extended, as stated above. However, *Puccioni's* assertion is upheld by *MacCurdy* (1923, 234) for Peruvian mandibles, when he states that, "in the collection as a whole, the coronoid process is almost without exception higher than the condoloid."

TEETH

All the teeth in the upper as well as in the lower jaws were erupted in B and C. This holds good for E too, except that in its lower jaw the third molars have not appeared. Of all the dentures only that of the lower jaw of C contains the full number of teeth; the others are slightly incomplete by postmortem loss. The teeth extant are recorded in the section on the State of Preservation (page 12).

Common in all the teeth is their wearing off, which, although not extravagant, is well pronounced and conforms with the degree of attrition generally met with in Indians of medium age. The third molars are better preserved in both jaws than the two other molars and the premolars, which demonstrates the diminishing functional strain in a fore-to-aft direction. The occlusal surfaces of the molars are beveled in the familiar way, i.e., slanting lingually-buccally in the two jaws. There is a more intensive attrition of the incisors and canines to be noticed in the female C.

The teeth are of medium size in every respect, showing the typical differences, in the molars, of five cusps in the upper and four in the lower, with a diminishing tendency backward. The molars diminish also in size and thus represent the condition of progressive phyletic differentiation.

No anomalies occur in our specimens, and no pathological conditions were noted. This refers particularly to caries, of which there is no indication at all. Due to a pathological process (periostitis, fistula), however, is the deterioration of the anterior alveolar borders of the lower left incisors of C, in such a way that openings of the alveolar wall at the ends of the roots were produced, while the alveolar margins remained unimpaired in the alveolus for i_2; while that of i_1 is only slightly affected.[1] The teeth themselves are normal.

A feature of special interest in Indian skulls, and one thoroughly studied by *Hrdlička* (1920),[2] is the "shovel-shape" of the incisors, and which is more elaborate in the upper than in the lower. In the Santa Barbara specimens this feature is merely indicated and may be described as "semi-shovel" in the upper incisors of B and C, and "trace" in E. The latter is noted also in the lower incisors of B, while there is no "trace" in C and E.

---

[1] Regarding this condition of alveoloclasia, see *Leigh* 1925, 190.

[2] In his extensive study of the literature that author traced the description of the feature under discussion back as far as 1844, while as an Indian character he first called attention to it in 1907 (article on "Anatomy" in Handbook of American Indians, *Bull. 30 Bur. Amer. Ethnol.*). According to *Hrdlička's* tables, pronounced "shovel-shaped" median incisors occur in 67%, and lateral incisors in 76%, while smaller percentages go to the "semi-shovel" and "trace." Thus, "keilo-koilomorphy" (better, perhaps, in English adaptation, from χεῖλος = lip and κοῖλος = hollow: "cheilo-cœlomorphy," or "chilo-cœlomorphy") must be considered a distinct racial character in the American Indian.

CONCLUSION

The study of the cranial material from Santa Barbara has disclosed a number of facts which are the outcome of a methodical investigation on a comparative basis, the more important of which will be briefly reviewed.

In general the size of the skulls as exhibited by their capacity, circumferences, and modules, was recognized as medium and tending toward smallness. This is in conformity with the findings of other authors. Thus, while *Boas* (1895, 407) has shown that the skulls from the California islands are smaller by 6% than those of the Plains, *Hrdlička* (1906, 54) asserts that "the California mainland crania are characterized by small size." The principal cranial diameters are therefore rather submedium and give rise to meso-brachycranial, ortho-hypsicranial, and metrio-acrocranial indices. If this is in keeping with the cranial averages of the California mainland and particularly those around Santa Barbara, the interesting fact was revealed in previous works that a difference of type occurs on the islands of the Santa Barbara archipelago in such a way that on the islands situated farther north (San Miguel, Santa Rosa, Santa Cruz, and Anacapa) shortheadedness predominated as against longheadedness on the islands farther south (San Clemente, Santa Barbara, San Nicolas, and Santa Catalina). A number of authors (*Carr* 1879; *R. Virchow* 1889; *Boas* 1895; *Matiegka* 1904; *Dixon* 1923, et al.) concur in this statement, which in part is corroborated by our own data on a series of crania from San Miguel island, used for comparison, and whose cranial length-breadth indices average 78.3 in the males and 79.2 in the females. The total frequency of meso-brachycrany in this series amounts to 91.7%, the rather insignificant remainder of 8.3% being dolichocrany. Further reference to these proportions will be made below.

A feature of particular interest in the Santa Barbara skulls is the degree of postorbital constriction expressed not only by direct measurements, but also in proportion to the cranial breadth. The transverse fronto-parietal index was shown to be metriometopic in skulls B, C, and D, and even stenometopic in E. The impression of this condition is peculiarly emphasized by the morphological behavior of the zygomatic processes of the frontal bone, which appear to be drawn out laterally in a horizontal direction. This has a bearing naturally on the fossa temporalis, which is relatively deep, and likewise on the appearance of the zygomatic arches in vertical aspect, thus causing the condition of phænozygy.

The smaller transverse extension of the frontal bones is met by their lesser vaulting longitudinally, a condition more pronounced in the Santa Barbara skulls than in La Chapelle-aux-Saints and Neandertal, and falls likewise below the San Miguel averages. The angle of frontal declination, on the other hand, corresponds at the same time with European conditions, exceeding even the San Miguel, Haida, and Eskimo averages of our table. However, the relative flatness of the frontal bones produces another interesting feature, viz., post-bregmatic elevation, a condition found quite typically in morphologically inferior races.

The glabella is only weakly developed in the male skulls as well as in the skull of the female.

The pars nasalis of the frontal bone was found rather long, but not so long as that of an Eskimo from Cape Nome. The width of the pars nasalis of the latter was in turn less extended, thus emphasizing the Mongoloid condition in contradistinction to the greater interorbital width in Europeans.

The orbits are meso-hypsikonchial and have the inferolateral angle rounded out as usually is found in Mongoloid skulls and which is drawn downward as a rule in Europeans.

The nasal indices are leptorrhinic in B and E, but slightly chamærrhinic in C, while the lower nasal notches represent advanced morphological conditions. This can also be said of the fossa canina. Altogether the facial detail is quite well proportioned and in harmony with the general facial dimensions which render our skulls mesēnic with a slight tendency toward euryēny, and which as such corresponds with the conditions most frequently met in the Indians of the Pacific Coast.

A feature of more decisive significance, but likewise not at all rare in the Indians of the Pacific Coast in general and of Santa Barbara in particular, is the more or less pronounced state of prognathy, especially in the alveolar region, where it falls as low as 68° in skull C. To this extent it recalls similar conditions in certain tribes of southern India, such as the Senoi, Semang, Singhalese, etc. In opposition to this the foramen magnum angle falls rather high in expression of a phylogenetically advanced stage.

From a purely descriptive point of view the facial complex appears somewhat out of proportion, i.e., rather small by comparison with the well-rounded and capacious brain case, as will be noticed by consulting the tables of curve systems and the photographs. This impression is conveyed not only by the flatter frontal outlines, but more so by the postbregmatic elevations and the bulky well-rounded postauricular portions of the brain case.

Muscle marks on the whole are weakly developed, the texture refined, and the general outlines quite gracile. This is especially true of the mastoids, the zygomatic bridges, and the processes of the zygomatic bones.

The fossa temporalis presents no anomalous conditions.

The dental arches are paraboloid in shape, and thus are of an advanced morphological state.

The infero-lateral orbital angle has been mentioned as characteristically Mongoloid, which is likewise true of the "shovel-shape" incisor teeth, and of the vertical outline of the nasal bones which is quite concave in all the skulls. The latter feature, as well as the pronounced alveolar prognathism, is also constantly referred to in the works of *R. Virchow* (1889), *Matiegka* (1904), and others.

The purely morphological evaluation of the numerous traits discussed in this study admits of a division into primitive or inferior and advanced morphological conditions. Among the first are to be counted: (a) the pronounced alveolar prognathism; (b) the flatness of the frontal bone; (c) the postorbital constriction; (d) the postbregmatic elevation; (e) the weak chin prominence, which is, however, also a Mongoloid trait. These are certainly compensated by such features as the relative cranial height; the normal degree of frontal declination; the advanced condition of the foramen magnum plane; the slight superciliary development; the shape of the dental arch; the teeth of elegant shape; and particularly the molar size conforming to phylogenetic reduction toward the third, and the apertura piriformis, not to speak of the refined texture of the bones and the general appearance of the skulls, which is anything but crude in the sense of more primitive finds.

If the problem of identifying the Santa Barbara skulls with the morphologically inferior ones of the Neandertal kind be thus disposed of, the question arises as to their position in the ethnical complex of the American Indians and particularly of the Indians of California. Relatively inferior morphological characters, if judged by Caucasoid standards, may occur and do occur in almost all the American Indian types, a number of them, however, representing racial characteristics at the same time. If some of them, on the other hand, occur, as in our finds, in a given locality, one may be justified in identifying them with a more ancient ethnological layer which in analogous cases inferred not only certain differences of type, but more primitive morphological conditions as well. The former suggestion, however, does not hold true in our case, for, as shown in pls. XIII and XIV, by the superposition of the cranial outlines of our skulls B and C upon such from San Miguel island, these outlines fairly coincide in every detail except the frontal section of the median sagittal arc, which shows the peculiar depression of the Santa Barbara skulls. They are thus seen to represent the type of their immediate environment, which, as stated above, is shortheaded in comparison with the more longheaded ones from the southern coast and the group of southern islands. These are of the Sonora cranial type (*Boas*), while the northern shorthead is very probably an intruder.

Finally, as regards the all-important geological condition in connection with our find, a statement by *Dr. Robert T. Hill* in the "Los Angeles Times" of November 13, 1923, may be referred to and the following paragraphs cited. Dr. Hill says:

> "The bones were found beneath about five feet of black vegetal soil, some of which might have been scraped down from the higher portions of the hill in the various grazing and horticultural operations which have taken place since the hill was occupied first by a large adobe Mexican ranch house and later by the [Ambassador] hotel, both of which structures have been razed by fire or otherwise.
>
> "The material in which the bones occur is a dark-colored impure earth carrying many fragments of shells and charcoal. This is slightly indurated but easily breakable between the fingers. The induration is like that which accompanies any old Mexican or Indian patio floor of today where much tramping and frequent throwing down of liquids occur.
>
> "It is all secondary surface material, and by no stretch of the imagination can it be interpreted as imbedded sedimentary strata beneath the original accumulation of the camp floor, as was alleged. Neither is there anything in connection with this material or its soil overburden which would justify the assignment of great age to it."

Having thus disposed of the geological evidence, the problem of Indian antiquity may once more be referred to. Proof of a relative antiquity of our finds may be seen in the fact that they were taken from a mound burial which *per se* might be considered as a sign of relatively old age. This, however, would hardly justify assigning to them an age older than our Christian era. Similar comments were advanced by *A. L. Kroeber*, *Clark Wissler*, and *W. K. Gregory*. There is thus a possibility of linking our finds with an ancestral strain in the sense of American Indian ethnogeny, which in turn would suggest an affinity with the early intruders into the locality where their remains were found, and perhaps even with those already on American soil. However, such speculation is lacking in proof.

Summarizing as a result of our methodical investigation, it must be stated that the designation of the Santa Barbara finds as a special variety of Homo primigenius (in *Schwalbe's* sense) and under the caption of Homo barbarensis or the like, is unjustifiable; nor do they present an assemblage of such morphological features as to warrant their recognition as a special racial unit within the ethnic complex of which they form a part. The Santa Barbara crania, in spite of their slight primitiveness, are truly Indian of recent morphological appearance and are related to the types of their specific habitat.

LITERATURE

BOAS, FRANZ. 1889. Deformation of heads in British Columbia. *Science*, XIII, pp. 364–365.

1895. Zur Anthropologie der nordamerikanischen Indianer. *Zschr. Ethnol.* (Verh.), XXVII, pp. 366–411.

CAMERON, JOHN. 1923. Osteology of the Western and Central Eskimos. *Rep. Canadian Arct. Exped.*, 1913–18, XII, pt. C.

CARR, LUCIEN. 1879. Observations on the crania from the Santa Barbara islands, Calif. *Rep. U. S. Geogr. Surv. West 100th Meridian* (G. M. Wheeler), VII, Archæology, Washington.

DALLA ROSA, L. 1886. Das postembryonale Wachstum des menschlichen Schläfenmuskels. Stuttgart.

EISEN, GUSTAV. 1904. An account of the Indians of the Santa Barbara islands in California. *Sitz. Ber. Kgl. Böhm. Ges. Wiss., Math-Naturw. Classe,* No. 1, pp. 1–30.

FALKENBURGER, F. 1913. Diagraphische Untersuchungen an normalen und deformierten Rassenschädeln. *Arch. Anthr.,* N.F., XII, pp. 81–95.

FRIZZI, ERNST. 1910. Untersuchungen am menschlichen Unterkiefer mit spezieller Berücksichtigung der Regio mentalis. *Arch. Anthr.,* N.F., IX, pp. 252–286.

HABERER, K. A. 1898. Über die Norma occipitalis bei Mensch und Affe. 86 pp. Munich.

1902. Schädel und Skeletteile aus Peking. 165 pp. Jena.

HOOTON, ERNEST E. 1920. Indian village site and cemetery near Madisonville, Ohio. *Pap. Peabody Mus. Amer. Archæol. Ethnol. Harvard Univ.,* VIII, no. 1, 83–137.

HRDLIČKA, ALEŠ. 1906. Contribution to the physical anthropology of California. *Univ. Cal. Publ. Amer. Archæol. Ethnol.,* IV, no. 2, pp. 49–64.

1907. Skeletal remains suggesting or attributed to early man in North America. *Bull. 33 Bur. Amer. Ethnol.* Washington.

1908. New examples of American Indian skulls with low foreheads. *Proc. U. S. Nat. Mus.,* XXXV, pp. 171–175.

1916. Physical anthropology of the Lenape or Delawares, and of the eastern Indians in general. *Bull. 62 Bur. Amer. Ethnol.* Washington.

1920. Shovel-shaped teeth. *Amer. Journ. Phys. Anthr.,* III, pp. 429–465.

KIEFFER, J. 1908. Beiträge zur Kenntniss der Veränderunger am Unterkiefer und Kiefergelenk des Menschen durch Alter und Zahnverlust. *Zschr. Morph. Anthr.,* XI, pp. 1–82.

KLAATSCH, HERMANN. 1908. The skull of the Australian aboriginal. *Rep. Pathol. Lab. Lunacy Dep. Sidney,* I, pt. III, pp. 43–107.

1909. Kraniomorphologie und Kraniotrigonometrie. *Arch. Anthr.*, N.F., VIII, pp. 101–123.

KOGANEI, Y. 1906. Über Schädel und Skelette der Koreaner. *Zschr. Ethnol.*, XXXVIII, pp. 513–535.

KOLLMANN, J. 1905. Varianten am Os occipitale; besonders in der Umgebung des Foramen occipitale magnum. *Anat. Anz.* (Verh. 19. Vers. Genf), XXVII, pp. 231–236.

1907. Varianten am Os occipitale, besonders in der Umgebung des Foramen occipitale magnum. *Anat. Anz.*, XXX, pp. 545–563.

LANGE, BERNHARD. 1924. Über Rassenunterschiede an der Regio pterica beim Menschen. *Anat. Anz.*, LVIII, no. 15/16, pp. 353–374.

LEIGH, R. W. 1925. Dental pathology of Indian tribes of varied environmental and food conditions. *Amer. Jour. Phys. Anthr.*, VIII, no. 2, 179–99.

LENHOSSÉK, M. V. 1920. Das innere Relief des Unterkieferastes. *Arch. Anthr.*, N.F., XVIII, pp. 49–59.

LÜTHY, A. 1912. Die vertikale Gesichtsprofilierung und das Problem der Schädelhorizontalen. *Arch. Anthr.*, N.F., XI, pp. 1–87.

MACALISTER, A. 1898. The apertura pyriformis. *Journ. Anat. Physiol.*, London, XXXII, pp. 223–230.

MACCURDY, G. G. 1923. Human skeletal remains from the Highlands of Peru. *Amer. Journ. Phys. Anthr.*, VI, 218–329.

MARTIN, R. 1905. Die Inlandstämme der malayischen Halbinsel. Jena.

1914. Lehrbuch der Anthropologie. Jena.

MATIEGKA, H. 1904. Ueber Schädel und Skelette von Santa Rosa (Santa Barbara-Archipel bei Californien). *Sitz. Ber. Kgl. Böhm. Ges. Wiss., Math.-Naturw. Classe*, no. 2, pp. 1–121.

MOLLISON, THEODOR. 1908. Beitrag zur Kraniologie der Maori. *Zschr. Morph. Anthr.*, XI, no. 3, pp. 529–595.

NEHRING, A. 1905. Menschenreste aus einem Sambaqui. von Santos in Brasilien. *Zschr. Ethnol.*, XXVII, pp. 710–721

OETTEKING, BRUNO. 1908. Ein Beitrag zur Kraniologie der Eskimo. *Abh. Ber. Kgl. Anthr.-Ethnogr. Mus.*, Dresden, XII, no. 3.

1919. The processus frontosphenoidalis of the zygoma and its bearing on the configuration of the orbit. *Anat. Rec.*, XVII, no. 1, pp. 25–31.

1920. Morphological and metrical variation in skulls from San Miguel island, California. I.—The sutura nasofrontalis. *Indian Notes and Monogr.* (Mus. Amer. Ind., Heye Found.), VII, no. 2, pp. 51–85.

1924. The Santa Barbara crania. *Indian Notes* (Museum of the American Indian, Heye Foundation), I, no. 2, pp. 76–83.

1924. Declination of the pars basilaris in normal and in artificially deformed skulls. *Indian Notes and Monogr.*, no. 27.

OPPENHEIM, ST. 1907. Die Suturen des menschlichen Schädels in ihrer anthropologischen Bedeutung. *Korr.-Bl. Deut. Anthr. Ges.*, XXXVIII, pp. 128–135.

PUCCIONI, NELLO. 1913. Richerche sulla forma del mento e dell' incisura sigmoidea negli uomini e nelle scimmie. *Archivio Antr.*, Florence, XLIII, pp. 3–39.

1914. Morphologie du maxillaire inférieur. *Anthropologie*, Paris, XXV, pp. 291–321.

RAUBER-KOPSCH. 1919. Lehrbuch der Anatomie des Menschen. II. Knochen. Bänder. 347 pp. Leipzig.

SARASIN, FRITZ. 1916–22. Anthropologie der Neu-Caledonier und Loyalty–Insulaner. C. Anthropologie. Berlin.

SARASIN, P. AND F. 1893. Die Weddas von Ceylon. III. Wiesbaden.

SCHLAGINHAUFEN, O. 1907. Ein Beitrag zur Craniologie der Semang, nebst allgemeinen Beiträgen zur Craniologie. *Abh. Ber. Kgl. Anthr.-Ethnogr. Mus.*, Dresden, XI, no. 2.

SCHWALBE, GUSTAV. 1899. Studien über Pithecanthropus erectus Dubois. *Zschr. Morph. Anthr.*, I, pp. 16–240.

SERGI, GIUSEPPE. 1893. Le varietà umane. Principi e metodo di classificazione. *Atti Soc. Romana Antrop.*, I, pp. 19–74. (English translation by D. G. Brinton in *Smithson. Misc. Coll.*, 1894, XXXVIII, no. 969, 61 pp.)

SULLIVAN, LOUIS R. 1920. The fossa pharyngea in American Indian crania. *Amer. Anthr.*, N.S., XXII, pp. 237–243.

1921. A few Andamanese skulls with comparative notes on Negrito craniometry. *Anthr. Pap. Amer. Mus. Nat. Hist.*, XXIII, pp. 175–201.

VIRCHOW, HANS. 1915. Die anthropologische Untersuchung des Gesichts-Skelettes. *Zschr. Ethnol.*, XLVII, pp. 323–372.

1918. Nasenbreite und Deklination des Orbital-Einganges. *Zschr. Ethnol.*, L, nos. 4/6, pp. 237–244.

1920. Die menschlichen Skeletreste aus dem Kämpfe'schen Bruch im Travertin von Ehringsdorf bei Weimar. 141 pp. Jena.

VIRCHOW, RUDOLF. 1875. Ueber einige Merkmale niederer Menschenrassen am Schädel. *Abh. Kgl. Ak. Wiss., Phys. Kl.*, Berlin (1876), 2. Abt., pp. 1–130.

1889. Beitrage zur Kraniologie der Insulaner der Westküste Nordamerikas. *Ztschr. Ethnol.* (Verh.), XXI, pp. 382–403.

WISSLER, CLARK. 1922. The American Indian. 2d ed. New York.

ZUCKERKANDL, E. 1877. Zur Morphologie des Gesichtsschädels. Stuttgart.

INDEX

Age of specimens, 12
Angle, coronal, 24
  inferior lateral, of orbit, 98
  foramen magnum, in deformed skulls, 62
  of frontal curvature, 50
  nuchal, 59, 60, 121
  See *Tables of measurements*
Antiquity of finds, 9, 154
  problems of, 15
Antrum maxillare, 77
Apertura piriformis, 104, 106, 107, 152
  clivus naso-alveolaris, 104, 107
  crista alveolaris media, 106
  fossa prænasalis, 105, 107
  incisura nasalis, 104
  margo nasoalveolaris, 104, 106
  margo nasospinalis, 104, 106
  naso-alveolar flexion, 104, 108
  notches, inferior, 106
  spina nasalis anterior, 106
Arcus superciliaris, 82, 152
  zygomaticus, 37, 41, 151
Asterion region, 33

Burton Mound, 9

Canalis, Canales
  condyloideus, 71
  hypoglossi, 72, 73
    absence, 72
    bipartition, 72

  - musculotubarius, 76

Chin
  - median (round), 127
  - lateral (squarish), 127
  - protrusion, 33, 126, 127, 151

Circummuscular zone, 121

Classification of bones, 12–14

Condylus occipitalis, 71

Correlations, intracranial and cranio-facial, 18–21

Cranial outline in norma verticalis, 21, 22
  - in norma occipitalis, 32, 59, 121–122

Cranio-facial correlations, 18–21

Crista infratemporalis, 39, 40
  - supramastoidea, 34, 35, 36
  - temporalis, 33, 34

Deformation, absence of cranial, 11–12
  - unintentional, 11–12, 14, 22, 32

Dental arch, 79, 151, 152

Evaluation of morphological characters, 151, 152

Face, 111, 120, 150
  - horizontal profilation of, 115, 116
  - protrusion, 33, 117, 118

Fontanelle, occipital, 21

Foramen, Foramina
  - incisivum, 78
  - infraorbitale, 109, 110
  - jugulare, 73
  - magnum plane
    - in artificially deformed skulls, 62
    - phylogenetic significance, 62, 151, 152

magnum shape, 70
mastoideum, 122
mentale, 128
nasale, 102
ovale, 75, 76
palatina majora, 77, 78
palatina minora, 78
parietale, 26
spinosum, 75, 76
supraorbitale, 83
Fossa canina, 107, 108, 150
condyloidea, 71, 72
mandibularis, 74
pharyngea, 5
pterygoidea, 76
supramastoidea, 34
temporalis, 37–41, 151

Geology of Burton Mound, 15
Glabella, 51
Gregory, W. K., 154

Harrington, J. P., 9
"*High-cheek*," 115
Hill, Dr. Robert T., 153
Hodge, F. W., 9

Incisura frontalis, 83
mastoidea, 34, 74
supraorbitalis, 83
Index, Indices. See *Tables of measurements*
Infranasion, 86
Infraporial extension, 44, 45, 64
Interorbital width, anterior, 87, 88

Intracranial correlations, 18, 12
Investigation, plan of, 15

Kroeber, A. L., 154

Lineæ temporales, 33
Lower jaw
  alveolar plane, 126, 132, 139, 141, 142
  anguli mandibulæ, 132
  "antero-basal" angle, 142
  basal border, 125
  canalis medianus (Bertelli), 129
  chin (negative, neutral, positive), 126
    corrective vertical, 126
    tangent, 126
    vertical, 126
  condylo-coronoid dilation, 128, 140
    height proportion, 140
  crista endocondyloidea, 128
    endocoronoidea, 128
  foramen mandibulare, 132
    mentale, 128
  fossa digastrica, 129
    mentalis, 125
    "postcoronoidea," 129
    præcoronoidea, 129, 132
    subcoronoidea, 129
  fovea sublingualis, 132
    submaxillaris, 132
  height of ramus (sigmoid and condylo-coronoid), 137
  horizontal tracing, 127
  incision (s. infradentale s. katoprosthion), 126
  incisura mandibulæ (sigmoidea), 128, 137, 140
    præmasseterica (s. præmuscularis s. præangularis), 125

    - subincisiva (s. incurvatio mandibulæ anterior), 125
    - submentalis (Klaatsch), 137
- linea mylohyoidea, 129
    - obliqua, 124
- median-sagittal tracing, 127
- nervus lingualis (sulcus), 137
- planum platysmaticum, 125
- pogonion, 126
- postero-basal angle, 141
- processus alveolaris and ramus (mutual behavior), 131, 132
    - condyloideus, 130, 140
    - coronoideus, 131, 140
- spina, spinæ, genioglossæ, 129
    - interdigastrica, 129
    - mentalis interna, 129
- striæ platysmaticæ, 125
- sulcus mentalis, 125
    - mylohyoideus, 132
- thickness of corpus (postmolar), 129
- trigonum mentale, 125
    - postcoronoideum, 129
    - postmolare, 129
- tubercula mentalia (s. platysmatica), 125

Manifestation of occipital vertebra (Kollmann), 72

Margo supraorbitalis (lateral extension), 82

Maxillofrontale, 87

Median-sagittal arc, divisions of, 46, 47

Method and plan of investigation, 15

Morphological position of Santa Barbara man, 152

Muscle marks, 33, 124, 151

Museum of the American Indian, Heye Foundation (Department of Physical Anthropology), 9, 11

Narrowing of face, 108
Nasal roof and prognathy, 101
  concaveness of, 99, 100
Nasion, depression of, 32
Naso-alveolar flexion, 104
Naso-zygomatic deviation, 118, 120
Norma basilaris, 69–82
  frontalis (facialis), 82–120
  lateralis, 31–69
  occipitalis, 121–124
  verticalis, 21–31
Nose, 98–107, 150
Nuchal angle, 59–62, 121
    correlations with, 59–63

Orbita, 88–98, 150, 151
Os, *Ossa*
  frontale, 82–91
    curvature, 48, 50, 149, 151
    declination, 48–49, 149, 151
    outlines, 53, 151
    pars (processus) nasalis, 85–90, 150
    processus zygomaticus, 30, 84, 85
  maxillare, 107–111
    corpus maxillare, 110, 111
    crista infrazygomatica, 108–109
    facial configuration, 111
    fossa canina, 108, 109
    processus alveolaris, 107
  nasale, 98–107
    horizontal outline, 99
    "Sanduhr"-shape, 102
    vertical outline, 33, 99, 100, 151
  occipitale, 58–65

        interparietal apex, 121
        median-sagittal outline, 32
        pars basilaris, 64–65, 75
        planum nuchale, 59, 62, 122
        posterior extension, 69
        protuberantia occipitalis externa, 59, 122
        relief, 32
        torus occipitalis, 122
        vaulting, 59, 60, 69, 121
    tympanicum, 32
        porus acusticus externus, 32
        thickening, 32, 74
    zygomaticum, 113–120
        crista infrazygomatica, 108
        horizontal outline, 115–118, 120
        naso-zygomatic deviation, 118, 120
        processus frontosphenoidalis, 42, 43, 151
            maxillaris, 107, 115
            temporalis, 37

Palate, anomalous perforation of, 77, 78
Palato-alveolar complex, 76–82
Phænozygy, 31, 149
Plagiocrany, 12, 14, 22, 32, 121
Post-auricular cranial extension, 32, 151
Post-bregmatic elevation, 32, 56, 57, 151
Post-orbital constriction, 22, 29–32, 40, 43, 84, 149, 151
Preservation, state of, 11–12
Processus condyloideus, 74
    frontalis, 42
    frontosphenoidalis, 42, 43, 151
    jugularis, 74
    marginalis, 42
    mastoideus, 32, 34, 70, 74, 151

  pterygoideus, 76
  styloideus (vagina), 74
  zygomaticus
    frontal bone, 30, 42, 83, 84, 149
    maxillary bone, 107
    temporal bone, 37, 74
Prodenty, 33
Profilation of face, 115–117
Prognathism, 65–69, 150
Prosopometer, 95

Refinement of facial parts, 108

Septum interorbitale, 89
Size of skulls, 15–18, 148
Skeletal remains, classification of, 11, 12
Spina nasalis anterior, 104, 106, 107
    posterior, 76
Spinæ palatinæ, 76
Squama temporalis, 34–37
  forward extension, 37
  lateral bulging, 37
  processus zygomaticus, 37
  shape, 34
Stenocrotaphy, 42
Sulcus arteriæ occipitalis, 74
  sphenoparietalis, 37
Sutura, Suturæ
  complication, 24
  coronalis, 22
  divisions, 22–24
  incisiva, 78
  infraorbitalis, 109, 110
  internasalis, 99

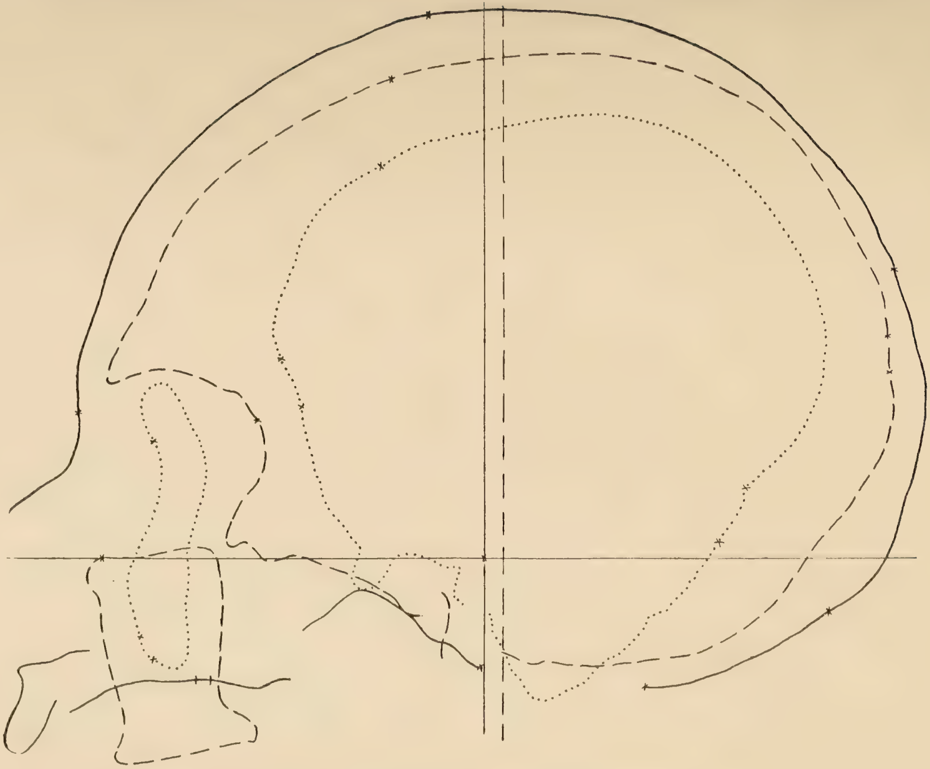
lambdoidea, 24
nasofrontalis, 98
obliteration, 24
palatina mediana, 78
  transversa, 78
sagittalis, 23
sphenoidalis, 37, 42
squamosa, 37

Tables of measurements, angles and indices
  Cranial size, 15
  Intra-cranial and cranio-facial correlations, 18
  Cranial measurements, 31
  Fossa temporalis, 41
  Cranial height measurements, 46
  Medium-sagittal arc, 48
  Os frontale, 54–55
  Os parietale, 58
  Nuchal angle, 60
  Os occipitale, 61
  Cranial base (angles), 65
  Vertical profilation, 67
  Foramen magnum, 71
  Maxillo-alveolar and palatal, 81
  Fronto-biorbital index, 85
  Processus nasalis ossis frontalis, 89
  Processus nasalis and orbita, 90
  Orbita, 92
    declination of, 97
  nasal measurements, 105
  corpus maxillare, 110
  facial measurements, 112
  os zygomaticum, 119
  cranial breadth and height, 123

capitulum mandibulæ, 131
mandible, 134
ramus mandibulæ, 138
mandibular angles, 142
Tassonomic method, 21
Technique, 15
Teeth, 146–147
completeness, 146
occlusion, 33, 146
pathology, 147
"shovel-shape," 147, 151
size, 146, 152
wear, 146
Torus palatinus, 76
occipitalis, 122
Tuber frontale, 82
parietale, 33
Tuberculum articulare, 37, 74
jugulare, 72
(fossa) pharyngea, 75
spinosum, 40
Type, difference of cranial, in southern California, 148

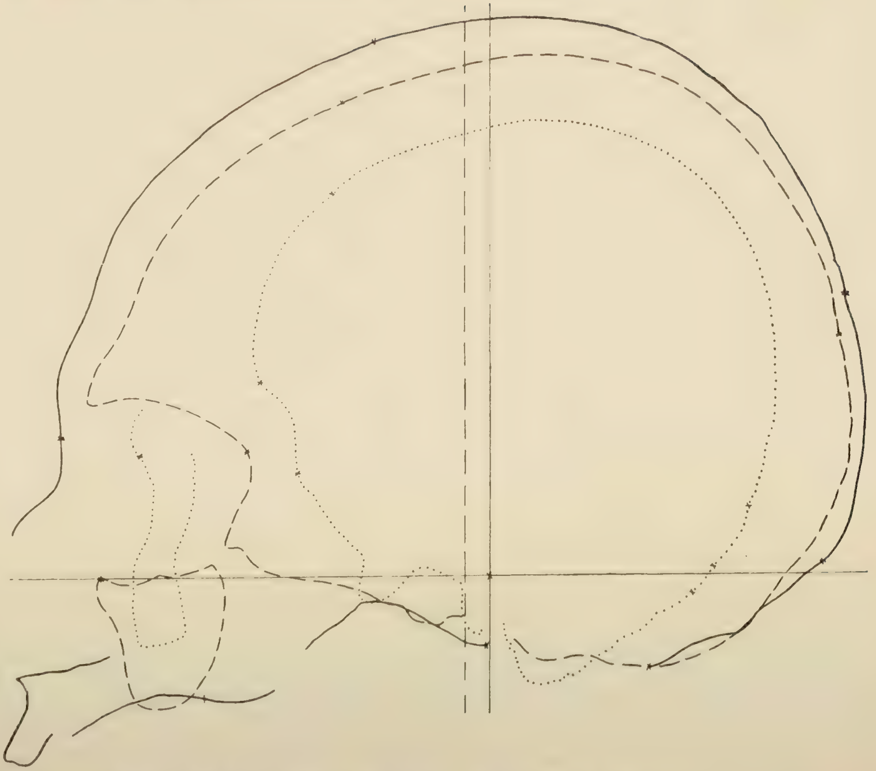
Wissler, Clark, 154

Zonula circummuscularis, 33, 121



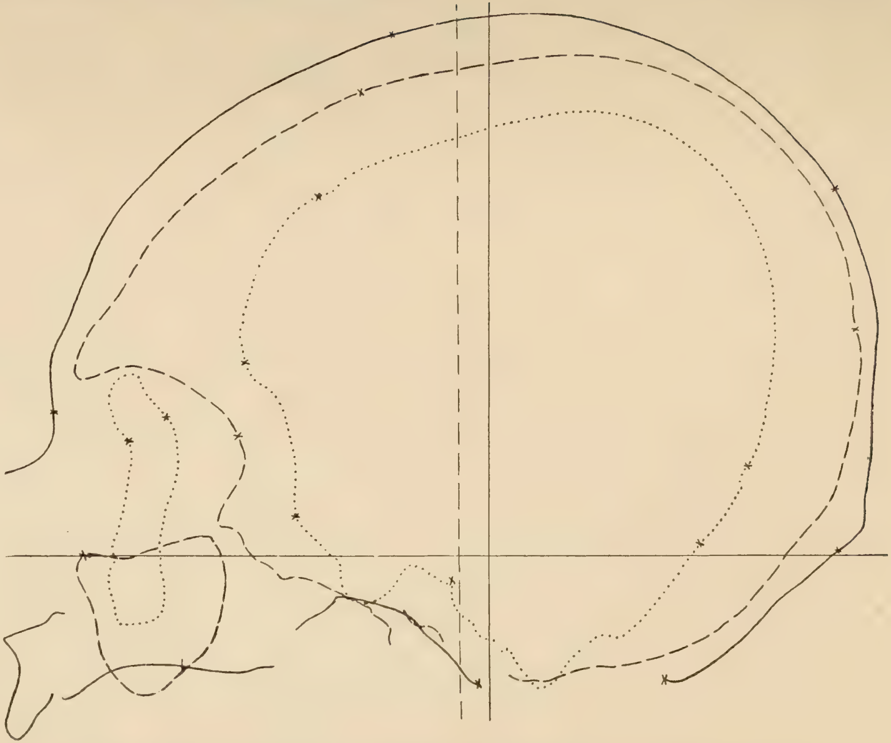
SYSTEM OF SAGITTAL CRANIAL TRACINGS OF SKULL B (♂)

——— median-sagittal. - - - - - - - mid-orbital. . . . . lateral orbital.
($\frac{1}{2}$ natural size)



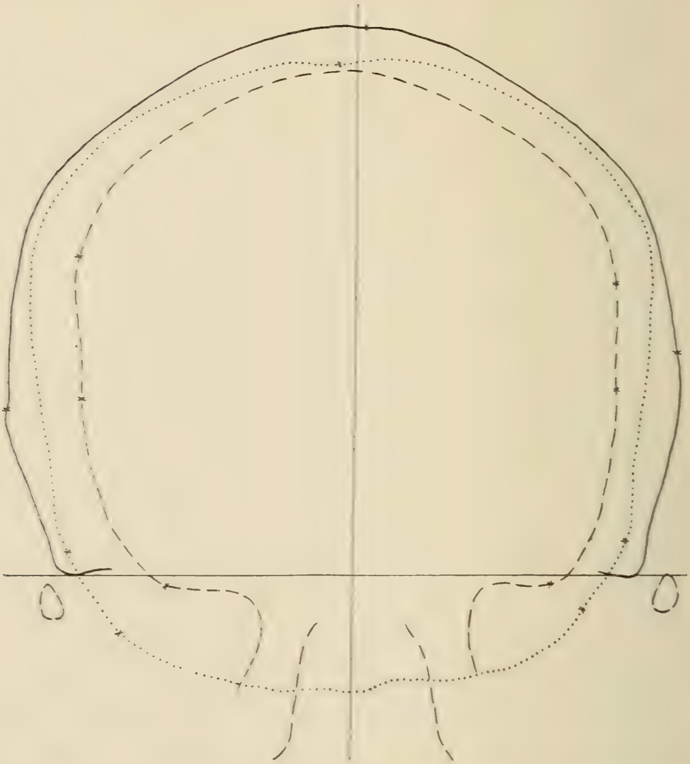
SYSTEM OF SAGITTAL CRANIAL TRACINGS OF SKULL C (♀)

The system is the same as in pl. I. (½ natural size)



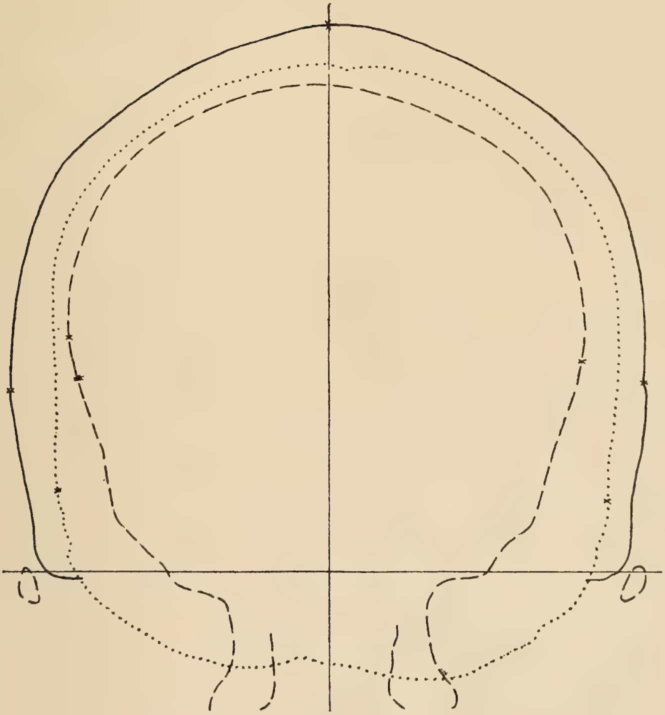
SYSTEM OF SAGITTAL CRANIAL TRACINGS OF SKULL E (♂)

The system is the same as in pl. I. (½ natural size)



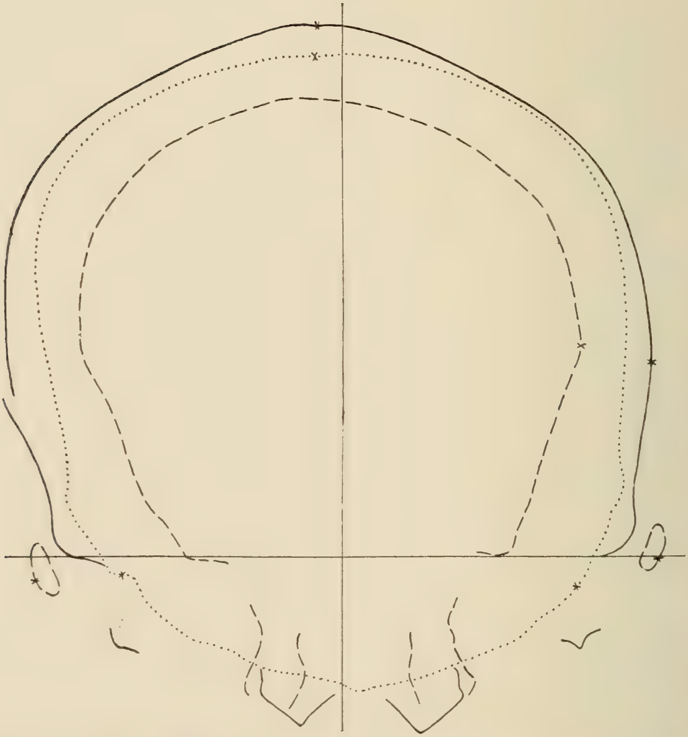
SYSTEM OF FRONTAL CRANIAL TRACINGS OF SKULL B (♂)

——— ear-frontal. - - - - - - - anterior frontal. . . . . posterior frontal. ($\frac{1}{2}$ natural size)



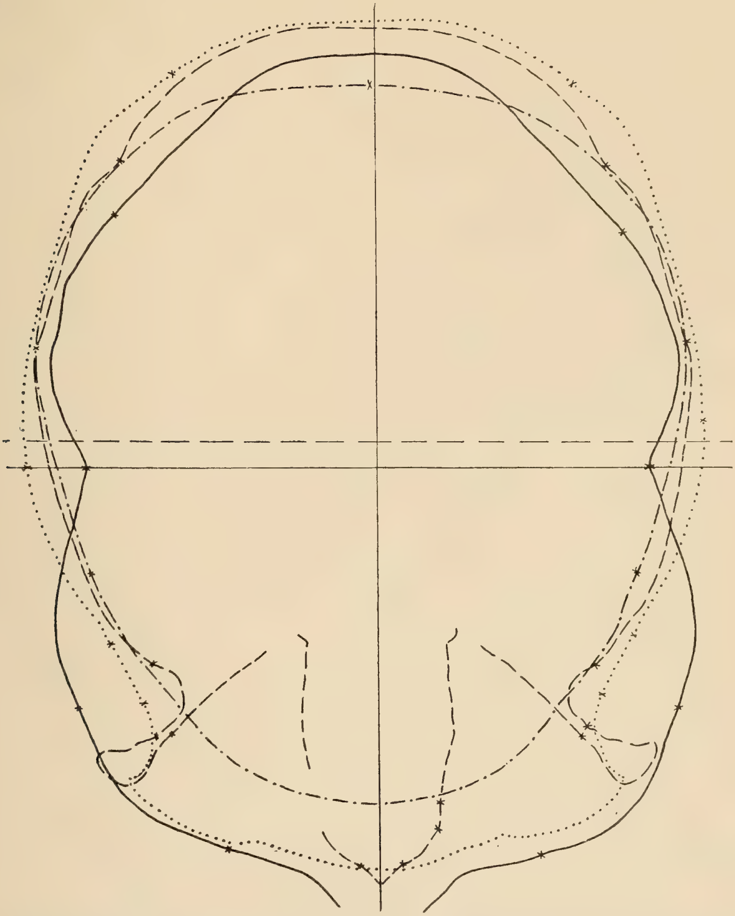
SYSTEM OF FRONTAL CRANIAL TRACINGS OF SKULL C (♀)

The system is the same as in pl. IV. (½ natural size)



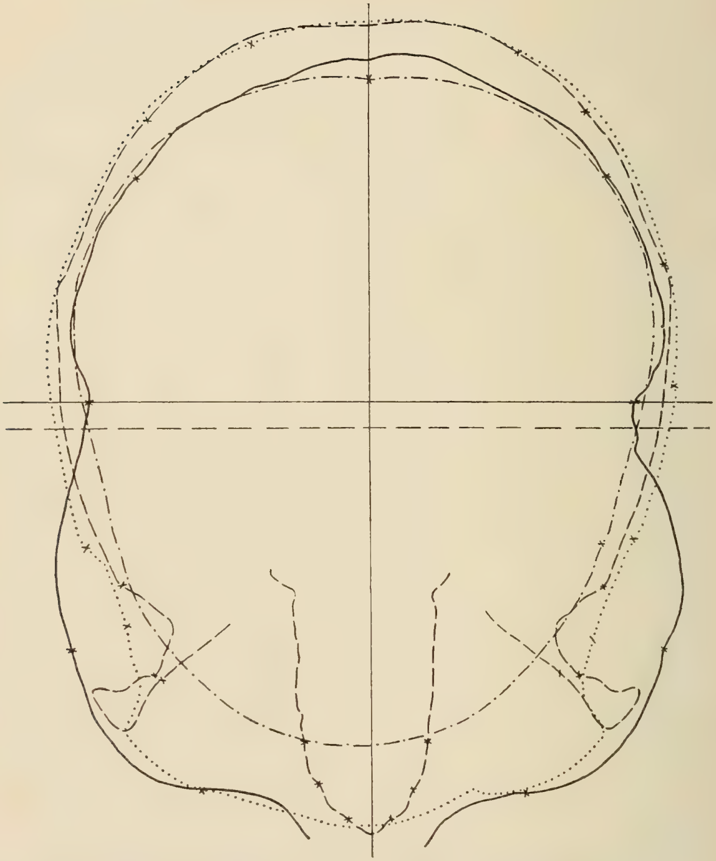
SYSTEM OF FRONTAL CRANIAL TRACINGS OF SKULL E (♂)

The system is the same as in pl. IV. (½ natural size)



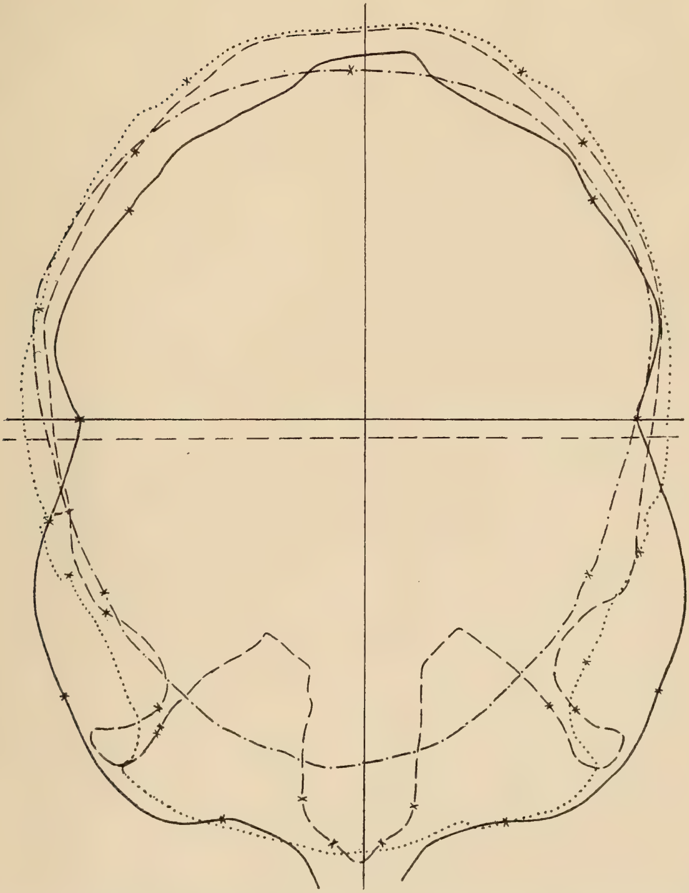
SYSTEM OF HORIZONTAL CRANIAL TRACINGS OF SKULL B (♂)

——— ear-eye plane. - - - - - - - midorbital. . . . . glabellar.
— · — · — vertex. (½ natural size)



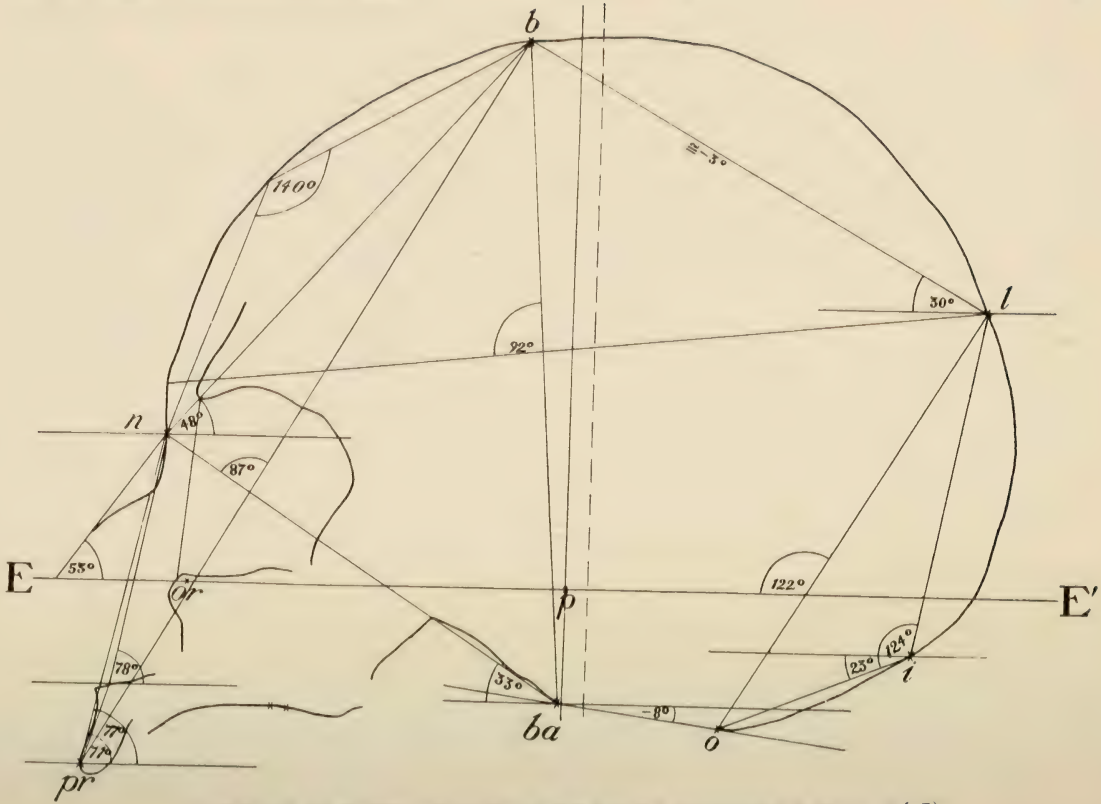
SYSTEM OF HORIZONTAL CRANIAL TRACINGS OF SKULL C (♀)

The system is the same as in pl. VII. (½ natural size)



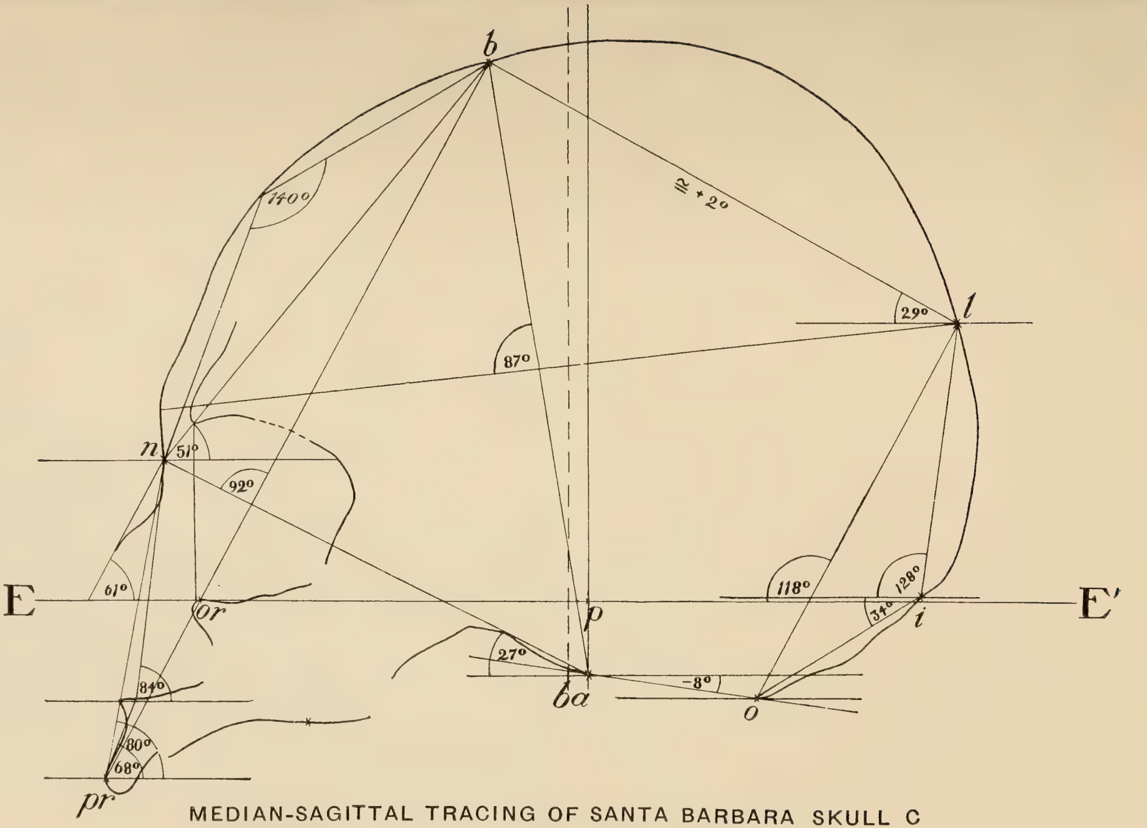
SYSTEM OF HORIZONTAL CRANIAL TRACINGS OF SKULL E (♂)

The system is the same as in pl. VII. (½ natural size)



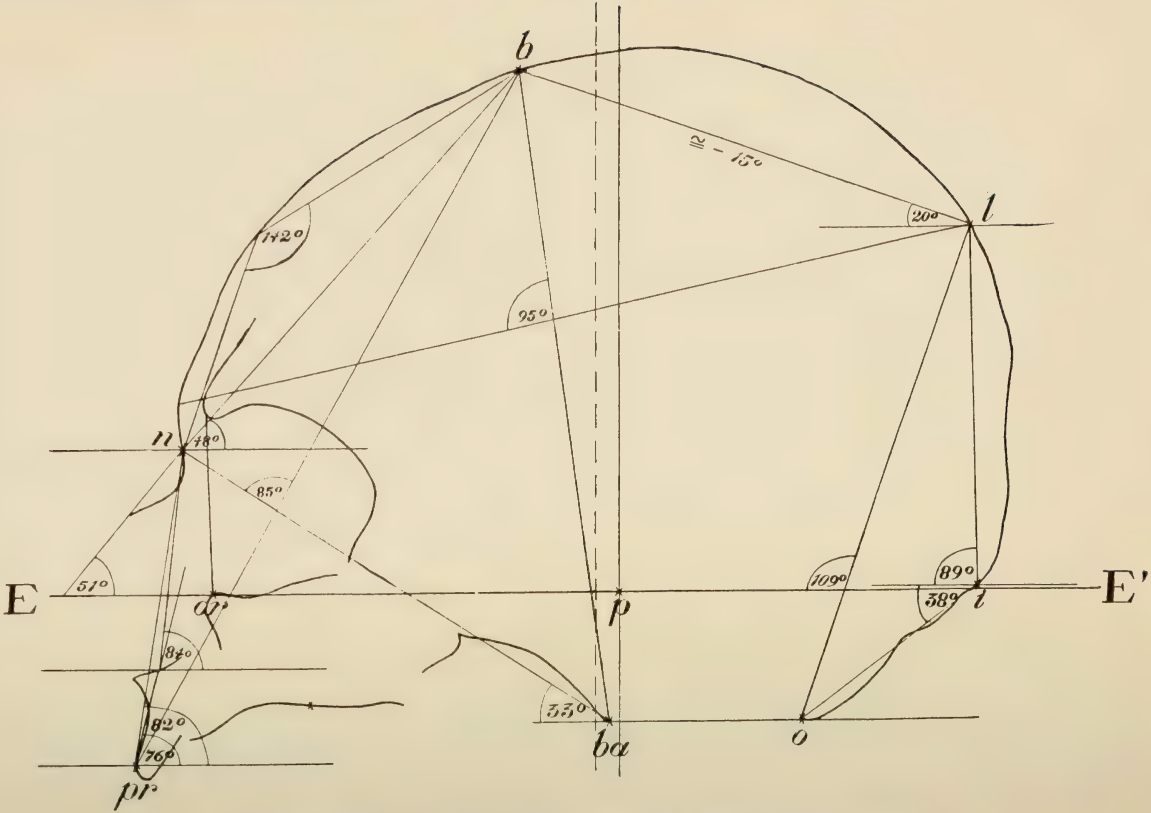
MEDIAN-SAGITTAL TRACING OF SANTA BARBARA SKULL B (♂)
IN EAR-EYE ORIENTATION, WITH ANGLES MARKED

(½ natural size)

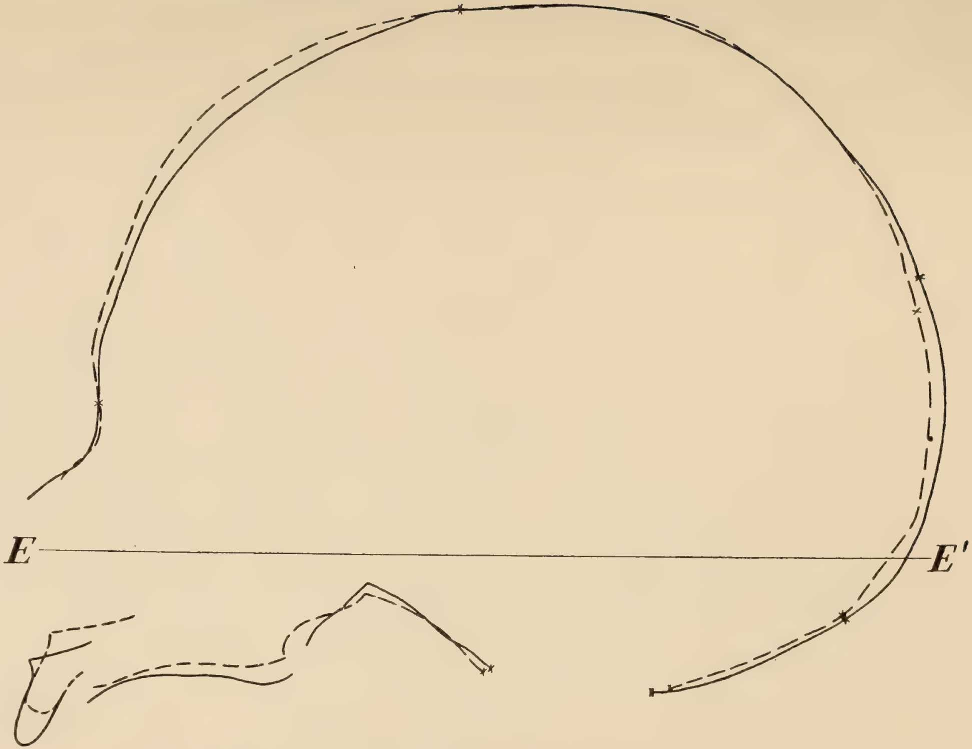


MEDIAN-SAGITTAL TRACING OF SANTA BARBARA SKULL C (♀) IN EAR-EYE ORIENTATION, WITH ANGLES MARKED

($\frac{1}{2}$ natural size)

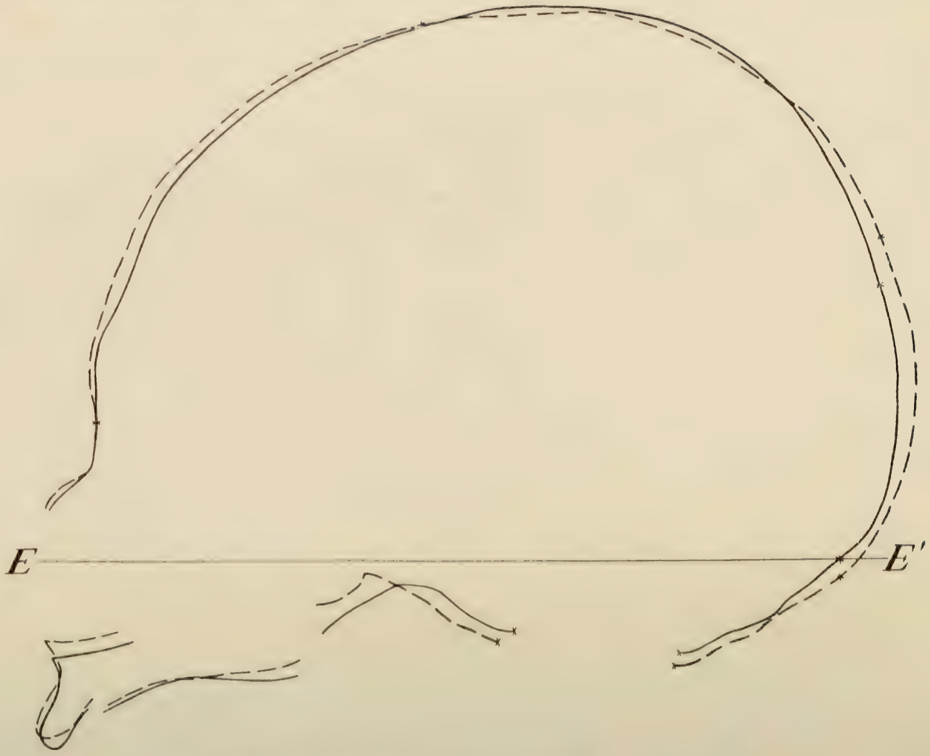


MEDIAN-SAGITTAL TRACING OF SANTA BARBARA SKULL E (♂)
IN EAR-EYE ORIENTATION, WITH ANGLES MARKED
(½ natural size)



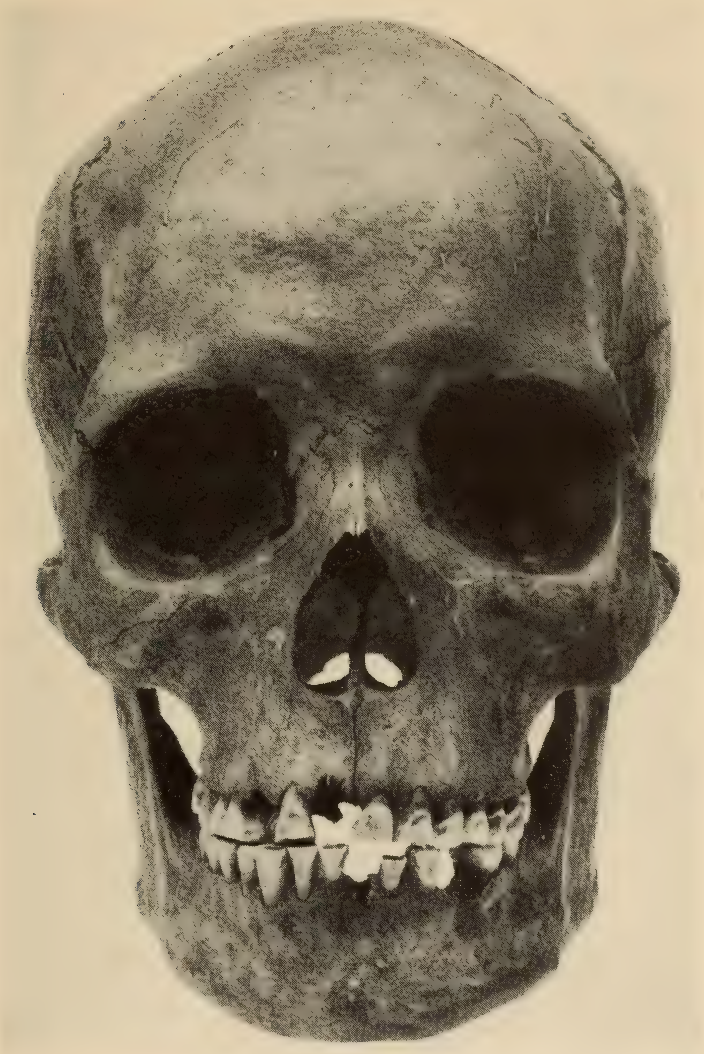
SUPERPOSITION OF MEDIAN-SAGITTAL OUTLINES

——— Santa Barbara B (♂); - - - - - - - San Miguel Island (277 ♂).
E—*E*′, ear-eye plane. (½ natural size)

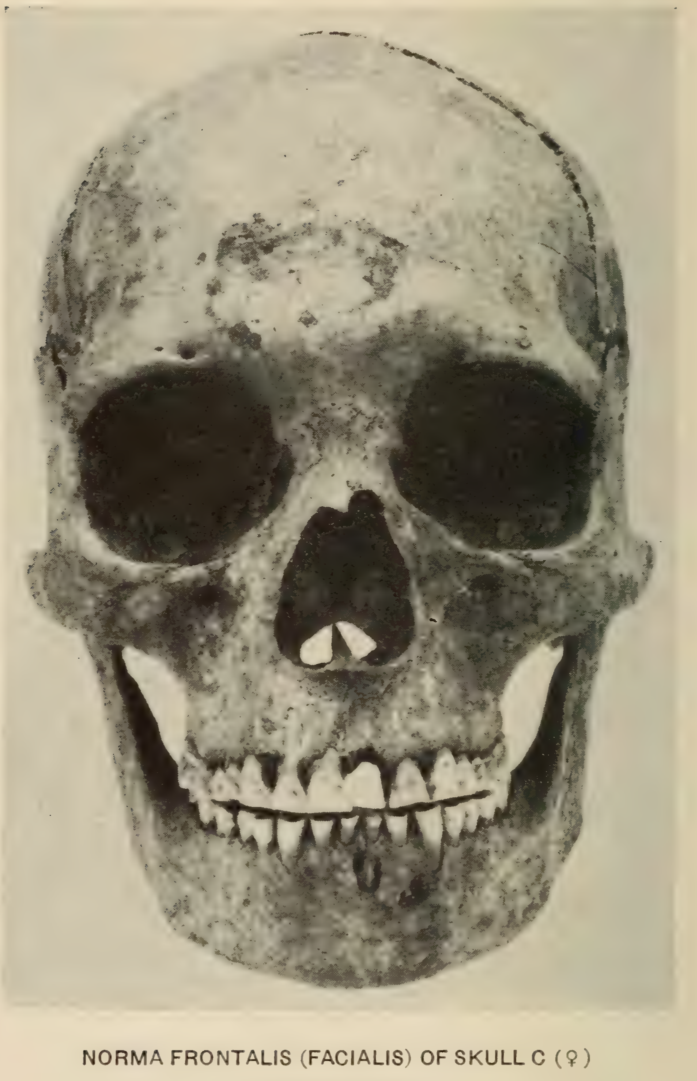


SUPERPOSITION OF MEDIAN-SAGITTAL OUTLINES

——— Santa Barbara C (♀); - - - - - - San Miguel Island (288 ♀).
E—E′, ear-eye plane. (½ natural size)

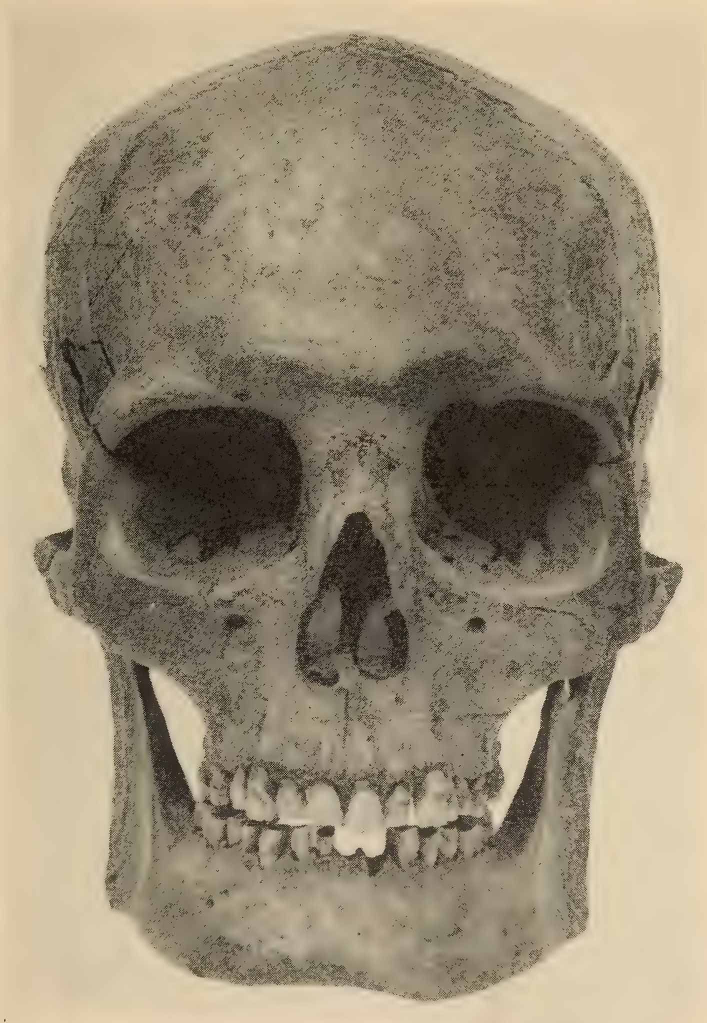


NORMA FRONTALIS (FACIALIS) OF SKULL B (♂)
(½ natural size)

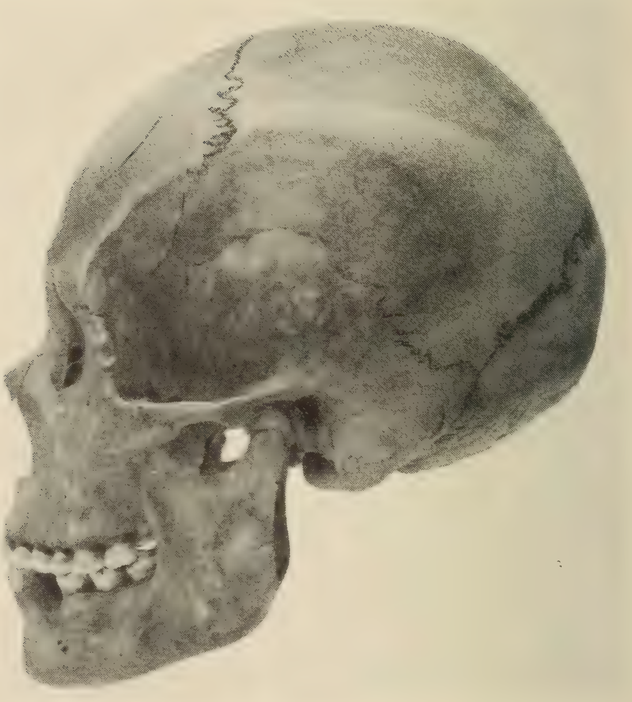


NORMA FRONTALIS (FACIALIS) OF SKULL C (♀)

($\frac{1}{2}$ natural size)

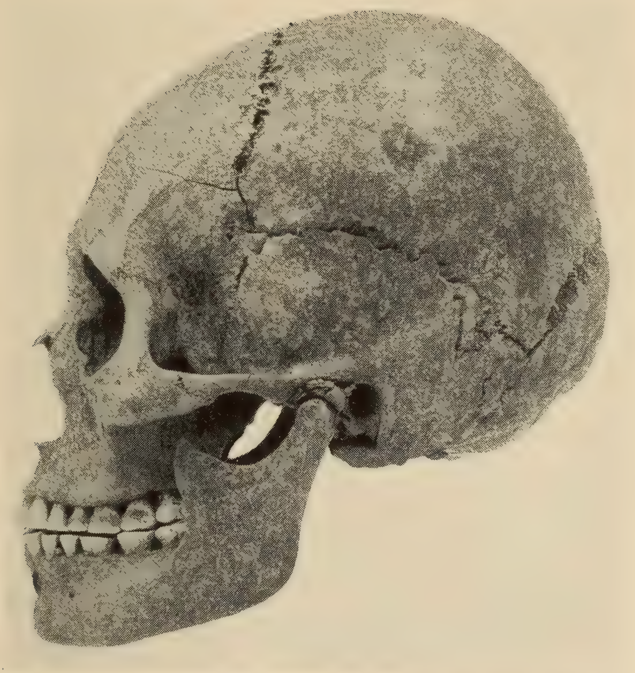


NORMA FRONTALIS (FACIALIS) OF SKULL E (♂)
($\frac{1}{2}$ natural size)



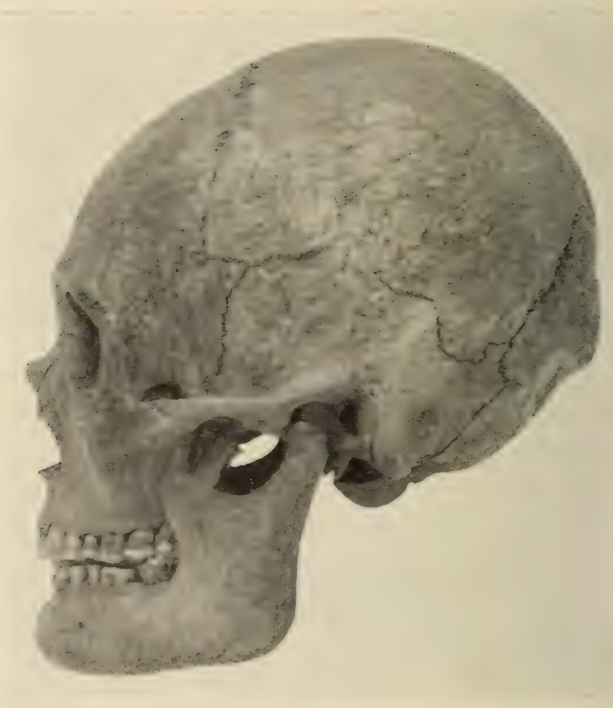
NORMA LATERALIS OF SKULL B (♂)

($\frac{1}{3}$ natural size)



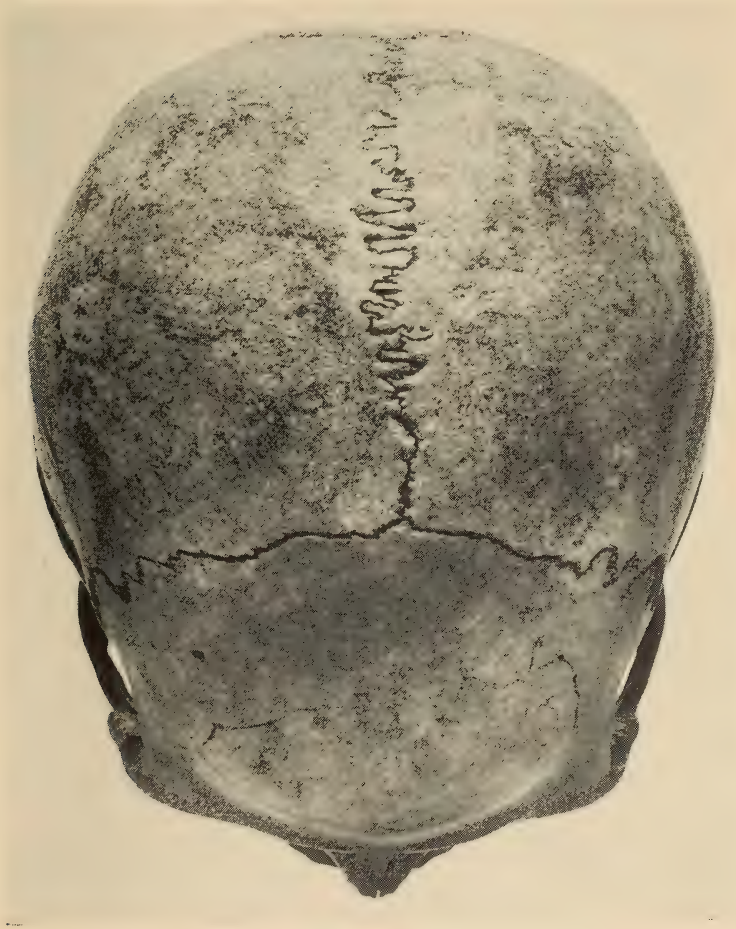
NORMA LATERALIS OF SKULL C (♀)

($\frac{1}{3}$ natural size)

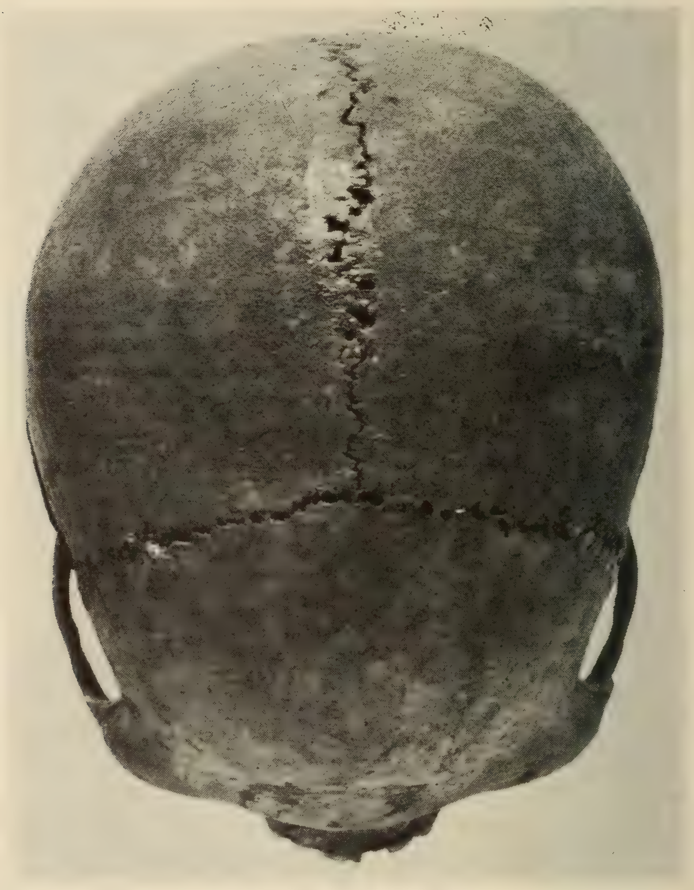


NORMA LATERALIS OF SKULL E (♂)

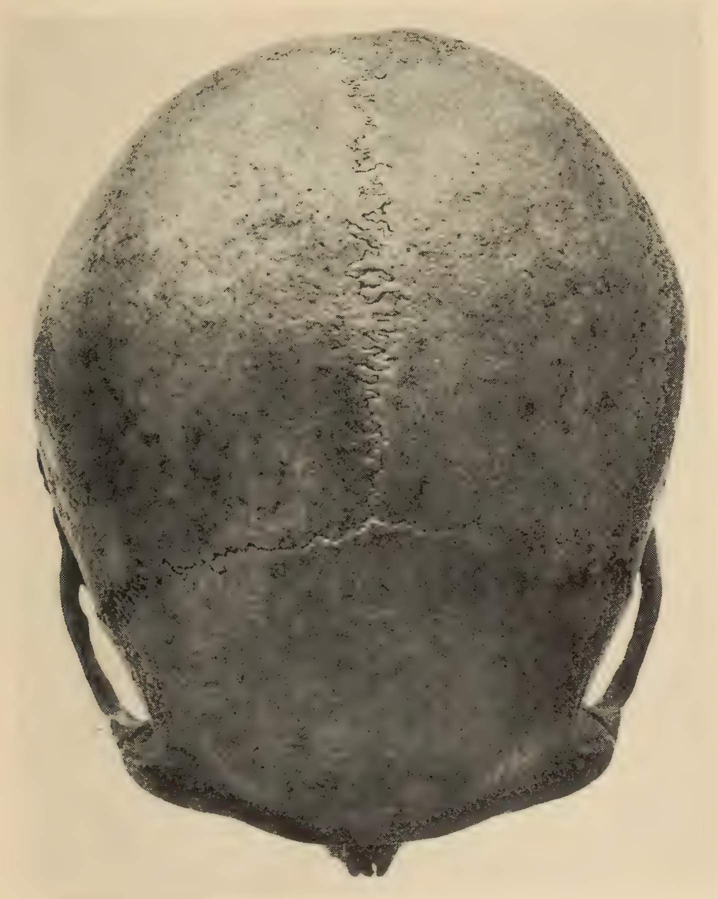
($\frac{1}{3}$ natural size)



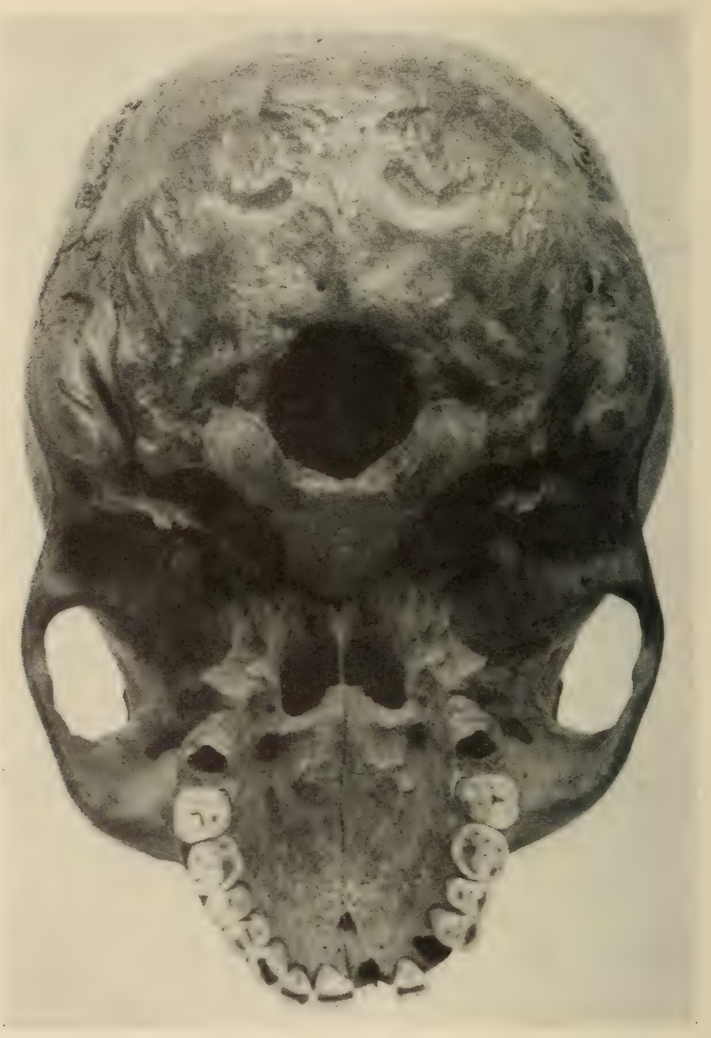
NORMA VERTICALIS OF SKULL B (♂)
(½ natural size)



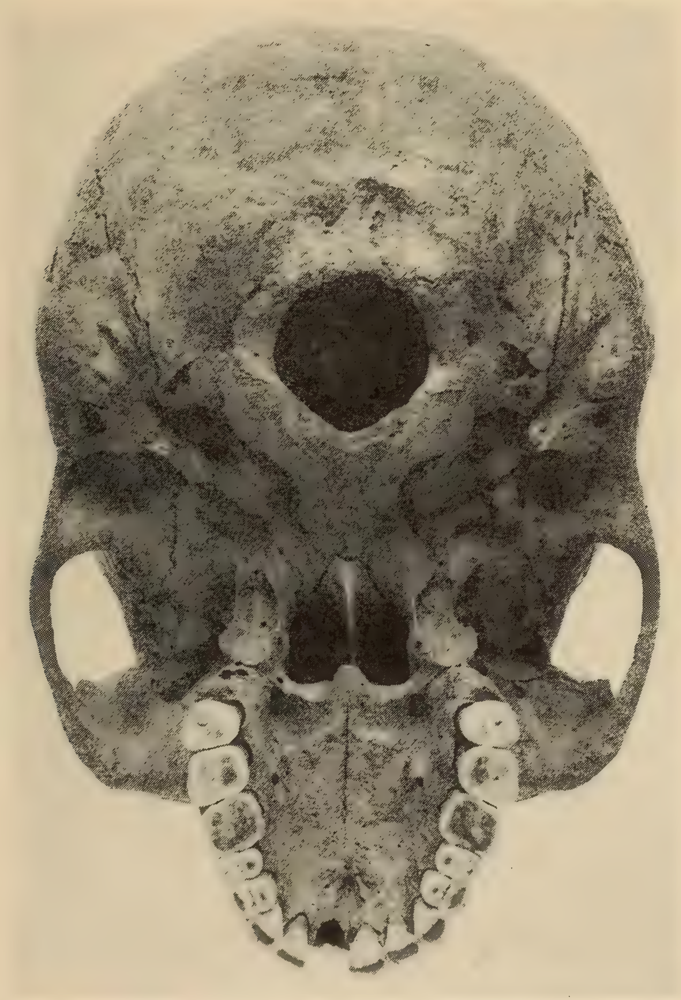
NORMA VERTICALIS OF SKULL C (♀)
(½ natural size)



NORMA VERTICALIS OF SKULL E (♂)
(½ natural size)

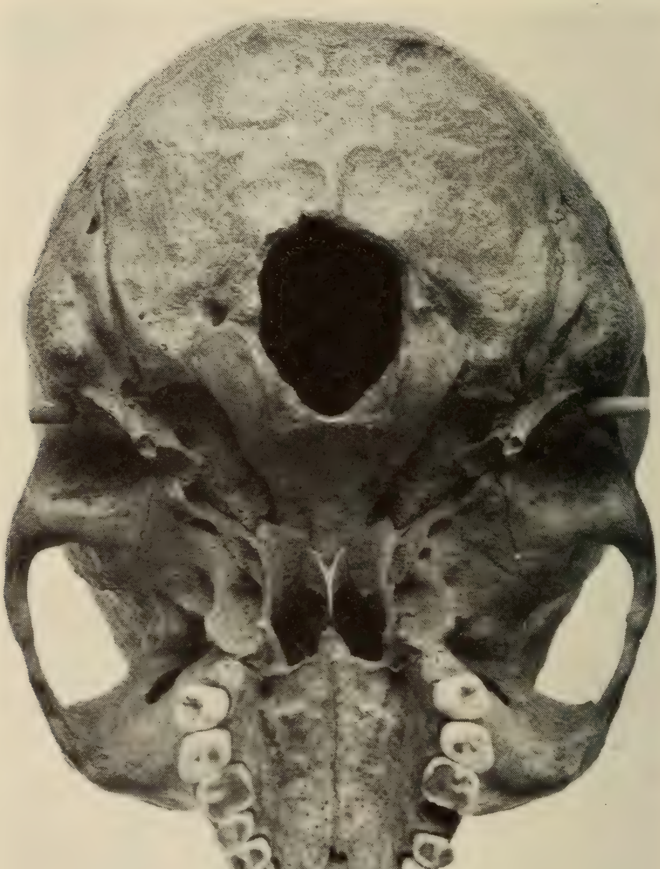


NORMA BASILARIS OF SKULL B (♂)
($\frac{1}{2}$ natural size)



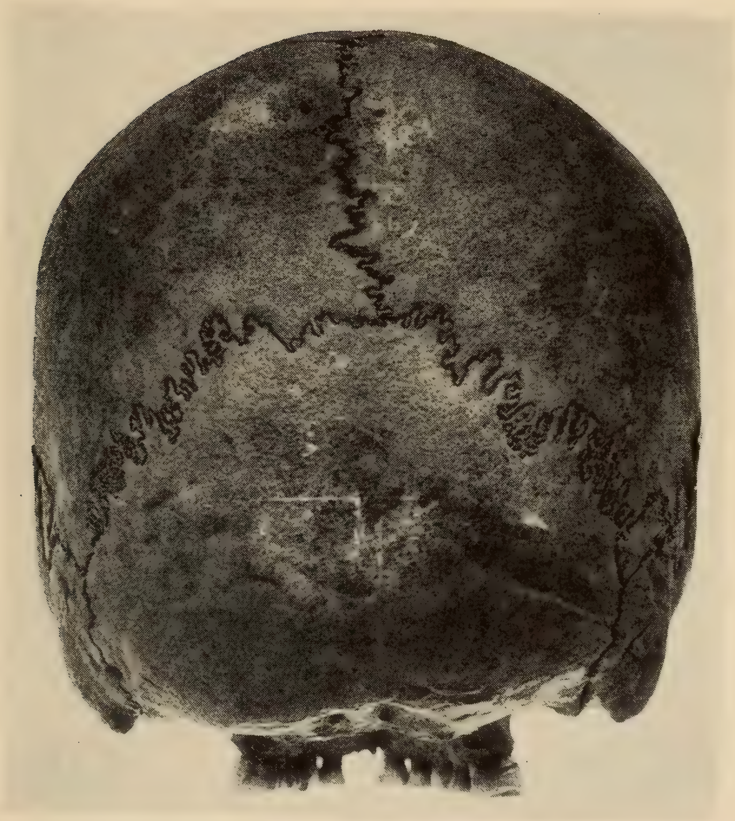
NORMA BASILARIS OF SKULL C (♀)

($\frac{1}{2}$ natural size)

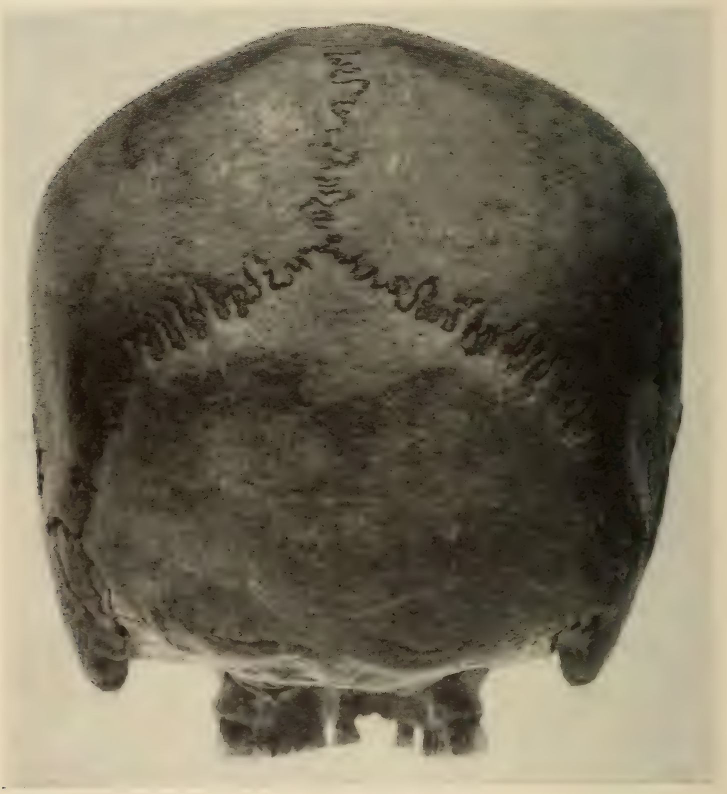


NORMA BASILARIS OF SKULL E (♂)

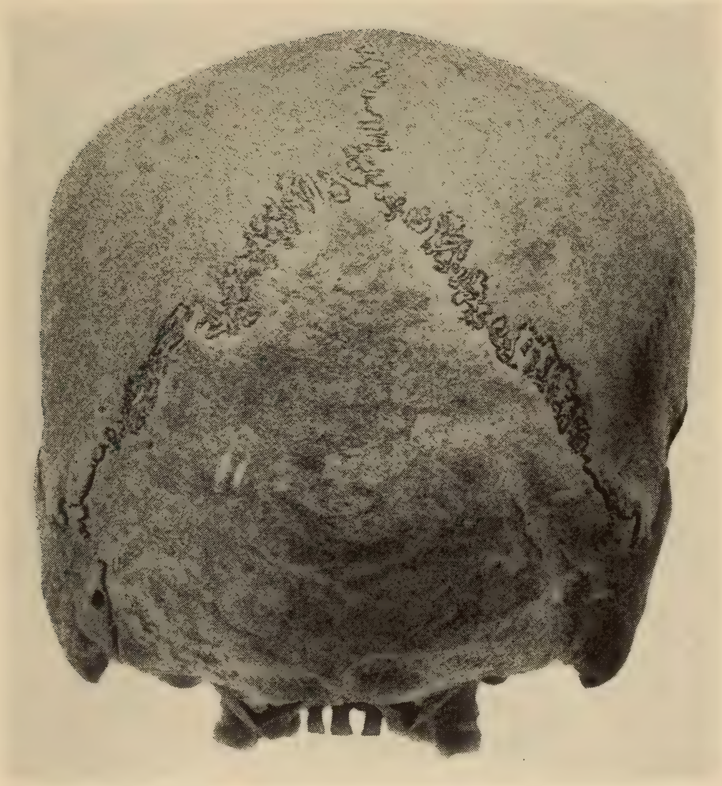
(½ natural size)



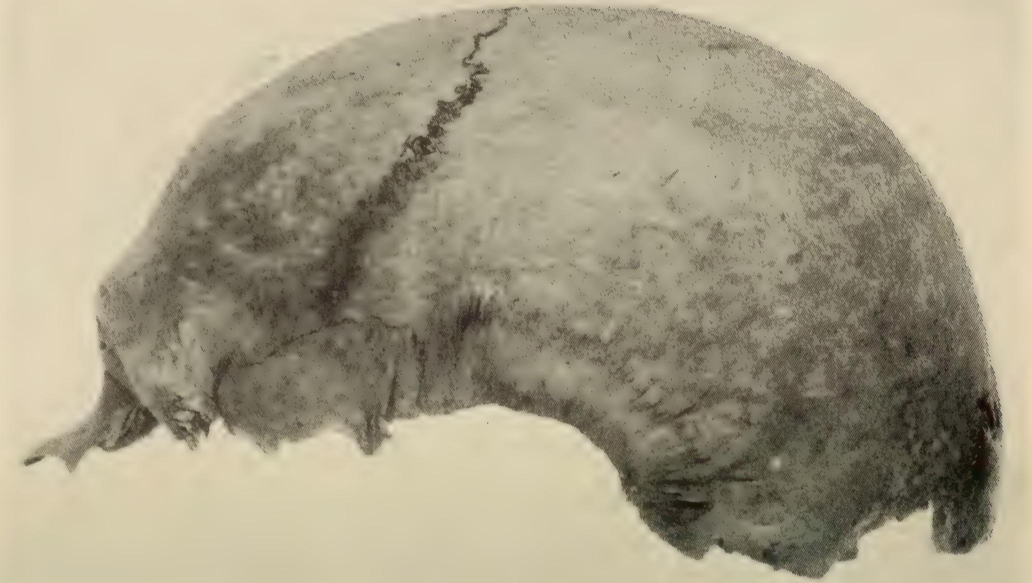
NORMA OCCIPITALIS OF SKULL B (♂)
(½ natural size)



NORMA OCCIPITALIS OF SKULL C (♀)
(½ natural size)

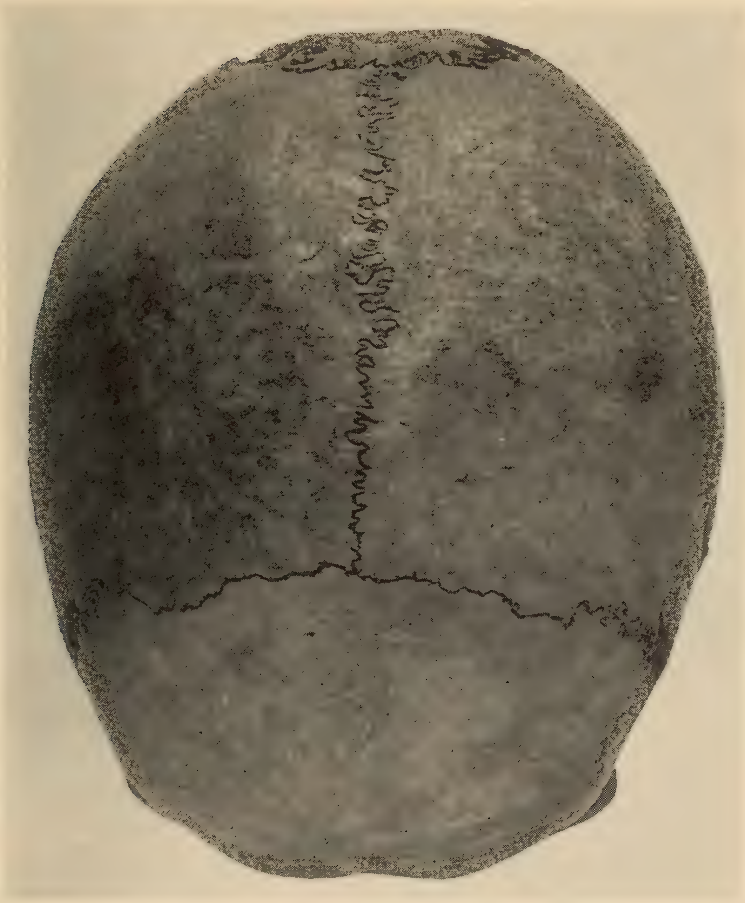


NORMA OCCIPITALIS OF SKULL E (♂)
(½ natural size)



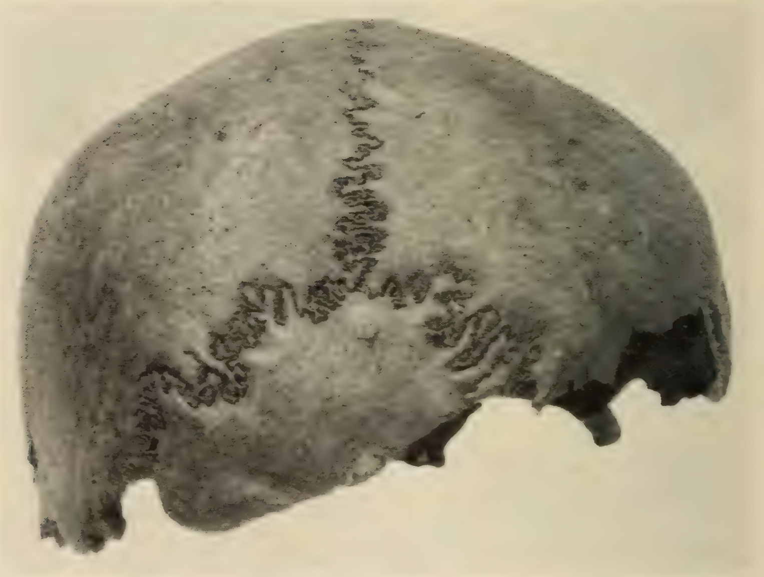
NORMA LATERALIS OF CALOTTE D (♂)

($\frac{1}{2}$ natural size)



NORMA VERTICALIS OF CALOTTE D (♂

(½ natural size)



NORMAL OCCIPITALIS OF CALLOTE D (♂)

(½ natural size)

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01528 2171